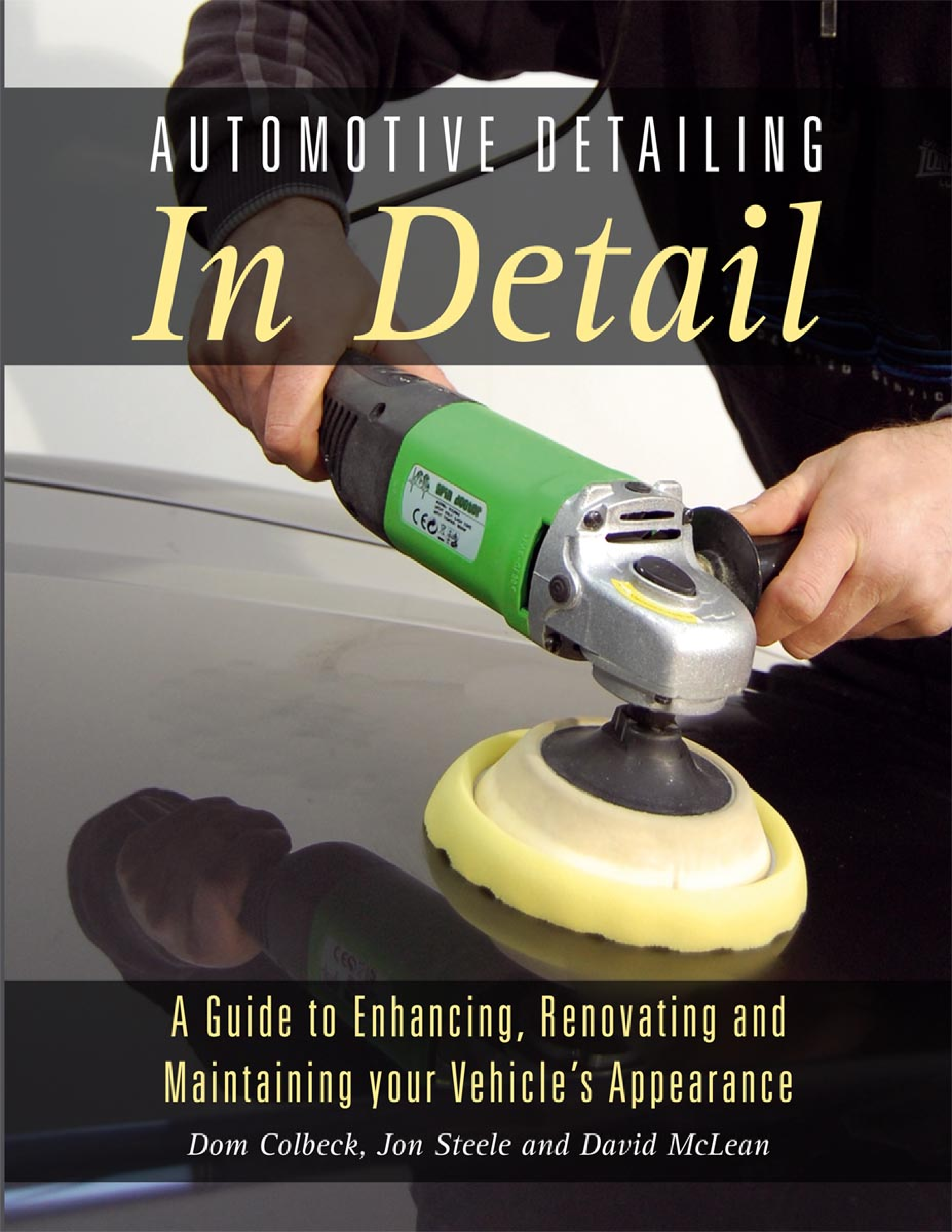
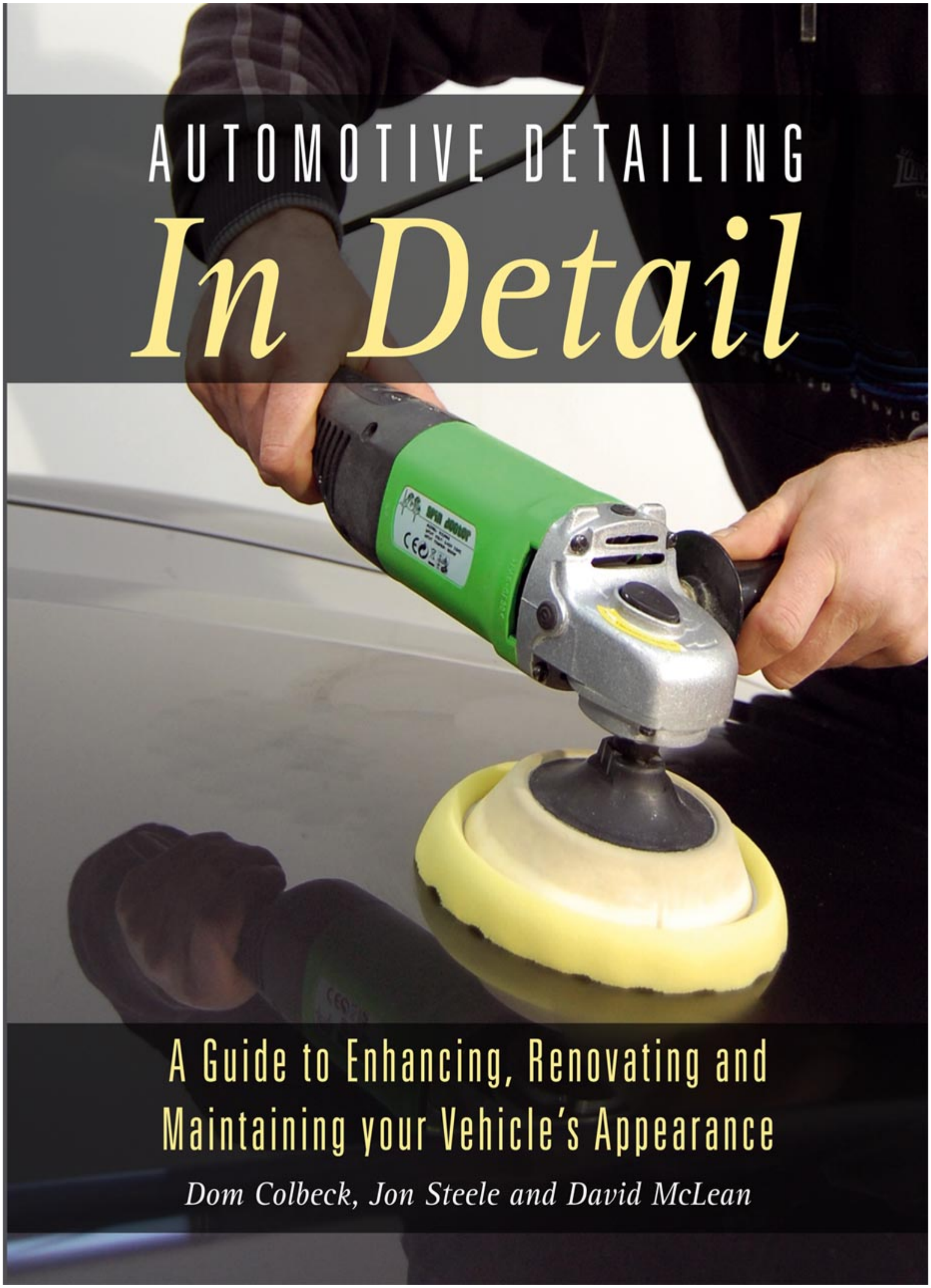


AUTOMOTIVE DETAILING
In Detail

A Guide to Enhancing, Renovating and Maintaining your Vehicle's Appearance

Dom Colbeck, Jon Steele and David McLean



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No responsibility can be taken by the author or publisher for direct/consequential or indirect/inconsequential loss or damage caused to a motor car or other vehicle or surface by the reader applying products, processes or techniques described in this book. All guidance is in general terms only and merely the opinion of the authors; no specific recommendations or suggestions should be acted upon without the reader carrying out all necessary forms of due diligence beforehand. If the reader is in doubt as to the effects of a detailing process, that process should not be undertaken.

Acknowledgements

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PREFACE

> Rules are not necessarily sacred, principles are.
> Franklin D. Roosevelt

Thanks to the explosive growth of the internet, car-care advice and information is abundant and accessible. After all, every car owner has experience of car care, and therefore an opinion on the subject. And there are a myriad of ways of looking after a car cosmetically, from slotting a token into an automatic car wash or driving to a hand car wash, to spending hundreds of pounds on a machine polisher and creating a finish that could rival – or better – that of a professional spray shop.

Detailing has risen in popularity, creating an abundance of readily accessible information; the problem is separating the valuable hints and tips from the chatter and chaff.

The variety of processes, products and techniques, coupled with every car owner's personal experiences, spawns millions of posts on forums and social media sites every year. That's a lot of suggestions, recommendations and advice.

Some of the content is, of course, extremely good. Videos can show processes in detail, and many forum/group members are knowledgeable, whether car-care professionals or not. The problem is that so much information – and no clear way to define what is good, bad or downright misleading – creates a lot of confusion. There is, in effect, more chaff than wheat. Add in compromised information disseminated by those with vested interests in certain products (such as car-care manufacturers), the peculiarities of internet behaviour (where the loudest and most argumentative posters often have the most authority) and long-standing myth and misinformation, and the waters get muddier still. Which leads us to this book.

The idea is to create a more definitive guide to car care, which the shifting sands of the internet simply can't provide. Competitive books on the market tend to be a little out-dated and invariably US-focused (the birthplace of 'detailing'). By investigating the surfaces of the car, the contamination and defects found on them, and then the products and techniques to decontaminate, perfect and protect those surfaces, the aim is to break down detailing to its fundamentals and provide a system that everyone can follow – and follow to good effect. A systematic approach, based on solid and established principles that can be applied time and again (whatever the surface or car), will be far more valuable than a dozen differing opinions given in reply to a narrow and specific question on a forum or group.

That said, this book isn't intending to supplant car care information on the internet. It should always be seen as a supplement to it, a common-sense fallback when confusion reigns or suggestions conflict.

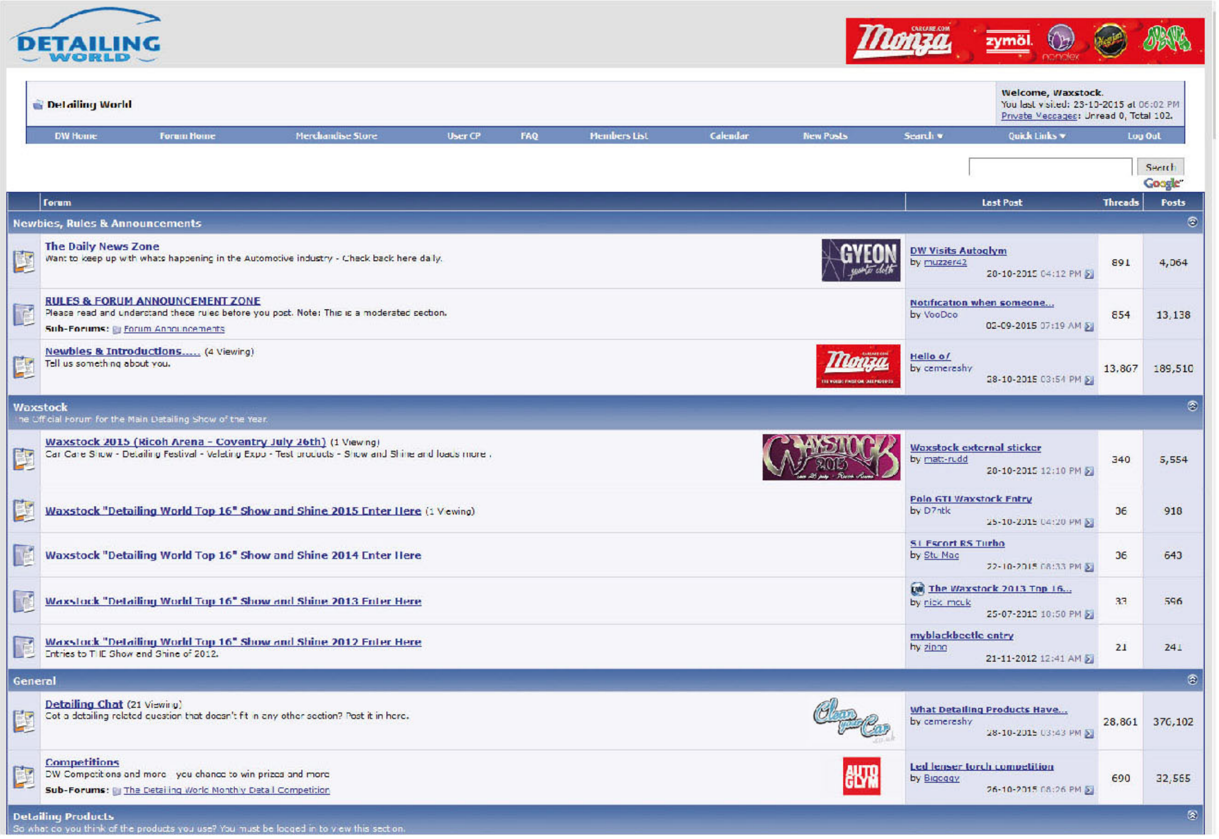
Also, remember that whilst it intends to be as definitive as possible, some aspect of detailing, or a crucial piece of car-care information, may be inadvertently missed out. How do you get a rhino-skin gear selector clean? What is the best way to polish a titanium sill guard? So the authors apologize in advance if the advice falls short, and reiterate that it is just that: advice. The advice may be considered, thoughtful and informed, but it will always be the thoughts of just a few people – what the authors have learned, what they have found to be useful and what they have found to be false. Given an infinite number of monkeys with access to typewriters and machine polishers, a superior book would surely result. . . and maybe in less time than a millennium or two.

ABOUT THE AUTHORS

Dom Colbeck is one of the founders of Dodo Juice, a manufacturer of hand-made car-care products. He has worked with some of the world's best detailers, and became proficient in detailing techniques early in Dodo Juice's history, when he realized that this would dramatically improve his understanding, testing and development of the products he was bringing to market. His passion is in dispelling the myths and misinformation that litter the car-care industry (and the internet) through his unique insights into the way products are made, and the way that they work. He has regularly held training and tuition days, for both amateur and professional detailers.

'**DaveKG**' is a famous name in internet detailing circles, and belongs to David McLean, an early pioneer of forum detailing guides. During his time testing and reporting on products, he has sourced five identical brand new cars (black Vauxhall Corsas) to minimize variables, travelled thousands of miles to detailing meets and training events, and written tens of thousands of words of advice. A reluctant legend, Dave enjoys great respect and recognition on detailing websites, but can thankfully walk the aisles of his local supermarket without undue harassment.

Jon Steele is a semi-professional detailer with an insatiable thirst for product knowledge and an evangelical desire to improve detailing processes. 'Semi-professional' means that he has a 'normal' day job, but has previously been commissioned to undertake extensive details on supercars as part of an exclusive detailing team. His academic and analytical style suits a deeper and more investigative approach to detailing matters.



Welcome, Waxstock.
You last visited: 23-10-2015 at 06:02 PM
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Forum	Last Post	Threads	Posts
Newbies, Rules & Announcements			
The Daily News Zone Want to keep up with whats happening in the Automotive industry - Check back here daily.	DW Visits Autoglym by muzzer42 20-10-2015 04:12 PM	891	4,064
RULES & FORUM ANNOUNCEMENT ZONE Please read and understand these rules before you post. Note: This is a moderated section. **Sub-Forums:** Forum Announcements	Notification when someone... by VooDoo 02-09-2015 07:19 AM	854	13,138
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Waxstock The Official Forum for the Main Detailing Show of the Year.			
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General			
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Detailing Products So what do you think of the products you use? You must be logged in to view this section.			

Internet forums and groups are an important source of information, but need to be treated with caution; often the 'loudest' member holds court, rather than the cleverest.

CHAPTER ONE

INTRODUCTION

ABOUT THE BOOK

Detailing guides tend to follow tried and tested formats – every task is tackled as a separate project, leading to a specific end result. But this inevitably means a large degree of repetition throughout the book, and it is a fragmented approach that often fails to empower the reader. The authors therefore decided that it would be better to interrogate the surfaces tackled and the products/equipment used, rather than just dictating a string of processes that would be followed blithely. After all, if you realize that your wheels have the same (or a similar) clearcoated finish compared to the bodywork of your car, then you can employ the same fundamental techniques to decontaminate and protect them. And if a detailing spray cleans a particular surface and adds gloss without leaving a chalky residue, there is nothing to stop it being used on textured black plastic exterior trim, or even the dashboard.

Some products are very versatile and can multitask. Never pigeon-hole a product, but learn what it is, how it works, and what it can do (for you).

Therefore, this book places more emphasis on specific surfaces, contamination types and detailing products than other guides (which tend to be obsessed with a narrow process). Of course, for simplicity, the book is still divided into a number of sections, so the structure will feel familiar and information will remain easy to reference. The second difference is the underlying philosophy of the book: less is more. Instead of encouraging a heavy-handed approach involving machine polishers and sanding paper, which may seem exciting and exotic, the virtues of a 'handsoff' or 'minimal interference' approach are extolled. The paint already on your car is finite, and restoring the finish is – in technical terms – a destructive process. Avoiding damage, and using the least amount of products and processes to correct it when it does happen, will always be preferential.

Aggressive techniques should be avoided in favour of a gentler regime. It is easier to repeat a gentler process than rectify damage caused by more aggressive actions.

In other words, if all your car needs is a wash, then just wash it. If it doesn't need a second coat of wax, stop after the first layer. This may appear to be an alien concept when other guides (perhaps created by car-care product manufacturers or resellers) encourage process after process, product after product, time after time. Yet it makes far more sense economically, environmentally and also philosophically.

Finally, an advanced apology for the heavy reliance on Dodo Juice products in photographic terms. Whilst this may seem like a subconscious sales technique, the simple reality is that photographing a product with a visible registered trade mark sometimes leads to legal complications for the authors and publisher. Using a Dodo Juice product will have no such implication. There are, of course, many alternative brands and products available. Choose the ones that suit you.

A HISTORY OF DETAILING

What is detailing exactly, and where did it come from? How does it compare to valeting? These aren't unreasonable questions to ask. Detailing has, after all, sprung up quite suddenly in the UK and usurped the less glamorous pastime of 'valeting', and has made the stuffier concours scene seem strangely remote and old-fashioned.

The Hot Rod scene was the forefather to modern automotive detailing.

The reality is that valeting and detailing have a large overlap, whilst concours preparation, although championing extremely high standards of car care (including many detailing techniques), is perhaps more concerned with originality, tradition and even mechanics. The term ‘detailing’ originates from the United States, where the Hot Rod scene has resulted in an enviable heritage of custom paintwork and amateur car modification and maintenance. Pinstriping and airbrushing show that a great deal of importance is placed on the exterior finish of a car – an irony perhaps, given that the original ‘Hot Rods’ were solely focused on performance rather than styling, with front wings, bumpers and other fixtures being removed to save weight. The modern interest in paint finish and exterior styling has generated a lust for lustre, and a desire to protect these finishes.

Polishes, waxes, sealants and glazes have been created in their thousands by an industry eager to help car enthusiasts make their cars look good, and keep them looking good throughout the year and for years to come. Naturally, the most thorough and impressive results come from attending to every surface, of every component, on the vehicle – so nothing the eye can see, or the concours judge can inspect (such as the inside of a glovebox), is left dirty, marked or dull (should a glossy finish be desired). Preparation of these ‘details’ leads to a natural extension: ‘detailing’. A suggested definition is:

> Detailing: The systematic and total decontamination, preparation and protection of the interior and exterior surfaces of a vehicle.

There are limits, naturally. Few detailers are going to remove an alternator to clean behind it, or attend to surfaces that cannot be easily seen or inspected. For many, the engine bay will remain untouched. This means that detailing will always have personal limits and a definition that is individual to detailers themselves.

It is attending to the smallest detail that sets detailing apart from mere car cleaning or valeting, but it falls short of full restoration (where paint is sprayed on to the car, rather than being merely corrected/refined).

If the authors were to suggest any limitations, it would be that detailing ends at heavy restoration of a finish, or mechanical work. Spraying rusty wheel nuts with paint, touching in stone chips and even replacing a flaking bonnet badge, would still fall under ‘detailing’. But a complete respray of a car would not. Removing rusty sections of bodywork and welding in replacements would, once again, be classed as mechanical restoration and beyond ‘detailing’. Nevertheless, write-ups that include this kind of mechanical restoration are particularly fascinating because they often show how a simple aim to ‘spruce up’ a car cosmetically through detailing, can lead to a much more comprehensive project.

So where does valeting fit into all this?

'Valeting' is less glamorous than detailing, but far more prevalent as a profession due to the demand for lower-end services at more affordable prices.

The easiest explanation is that valeters clean – and even 'detail' – cars, but do so on a purely commercial basis, and offer a faster, less intensive service than fully fledged 'detailers' (perhaps omitting to 'mop' – that is, machine polish – a vehicle). Originally, 'valet' came from the French word for servant, and in the United States a 'valet' is the man who parks your car for you when you arrive at an upmarket hotel or restaurant. Valets are also those male service staff who wait on wealthy individuals, and who are employed (even to this day) by hotels, to look after guests. When the drinks have been served and the shirt collars pressed, it would perhaps be a natural extension of the role for a valet to see to his master's motor car.

Whilst employing a valet is rare in the UK these days, the role of gentleman car cleaner – or perhaps of a servant undertaking a chore – remains ingrained in public consciousness, and the job title of 'valeter' has resulted. From a theoretical point of view, a valet should clean a car to his employer's liking, rather than 'valet' or detail a car to a specific standard. But that is splitting hairs. 'Valeting' became a popular concept in the UK in the 1980s and 1990s, and effectively became a byword for 'car care' until 'detailing' came along: an exotic American concept that promised a higher level of fastidiousness and even greater car care results. It means that today, valeting is often seen as detailing's lower end relation, with paint correction regarded as the main differentiator between the two activities (perhaps because the Americans had more of a propensity to machine polish their cars).

Whether the lack of such a strong Hot Rod culture in the UK gave rise to valeting rather than the more intensive 'detailing' is difficult to say. Could it have led to a greater reliance on third parties to clean cars for owners (rather than the owners doing it themselves)? There is certainly less of a historical car modification scene in the UK compared to the United States, although this isn't so true today, partly due to UK motor-sport expertise. If the average Englishman had been more likely to get someone to 'valet' his car rather than to 'detail' it himself (like his American cousin) it won't necessarily be the case currently, especially within the specialist car-care enthusiast 'detailing' community. English-owned sites such as Detailing World (www.detailingworld.co.uk) now rival (or even overtake) the largest American sites, and the content is recognized as being amongst the most authoritative in the world.

Just as valeting involves an element of 'detailing' (to a certain degree), concours preparation will, by necessity, involve detailing. Most detailers find themselves entering the less formal, less traditional and less élitist 'Show and Shine' competitions, where cars are judged generally on the standard of detailing employed, rather than the originality or mechanical aspects of the car. Concours (or Concours d'Élégance, in longhand) competitions are arguably an even higher form of Show and Shine competition due to the additional criteria that entrants must meet, and the emphasis on the originality or quality of the restoration work. That said, Show and Shine competitions may be more concerned with paint correction, whereas that could be a smaller part of an overall concours score. What remains true is that every competition judging the appearance of a vehicle, whether Show and Shine or concours, will have different interpretations and assessments of preparation and finish, and so it is difficult to categorize them completely or compare them accurately.

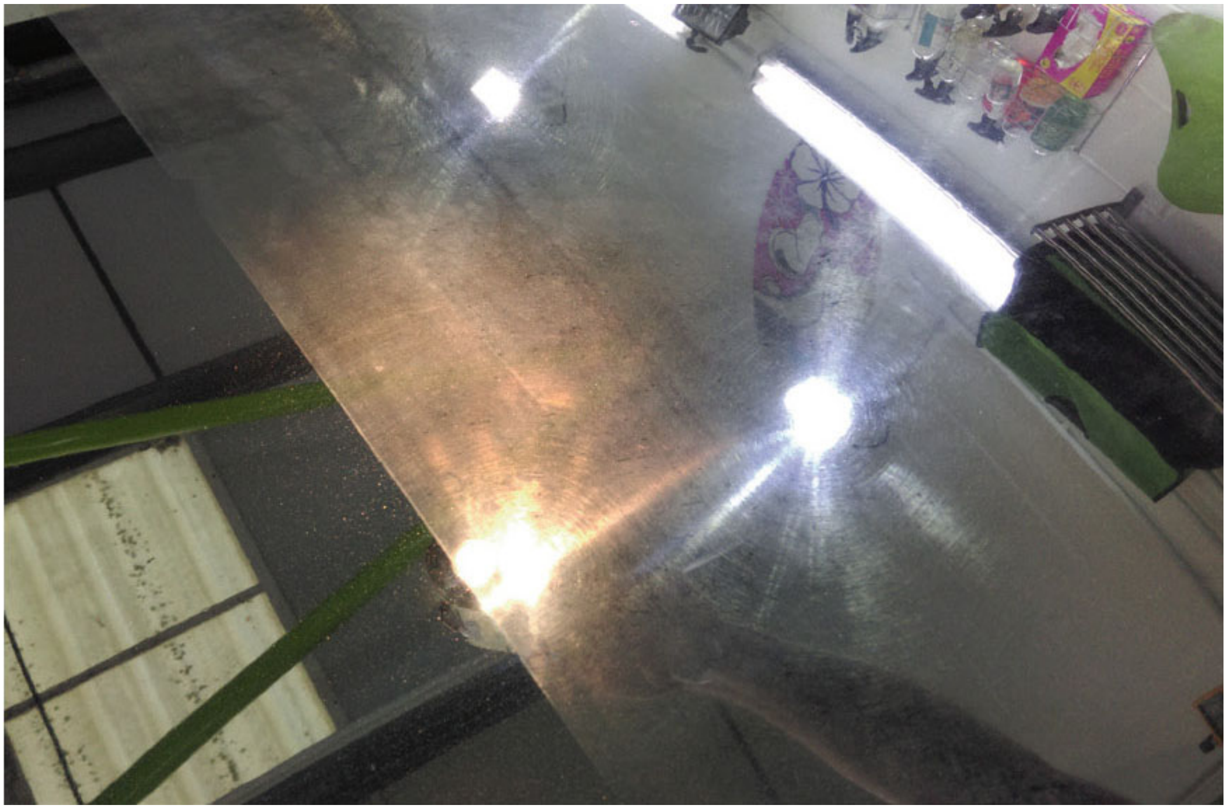
THE ATTRACTION OF DETAILING

There is one last topic to cover in this introduction: why do we detail? What is it about making a vehicle clean and shiny that propels this hobby and industry forwards at such great pace? For many, detailing is seen as a waste of time. ‘Cars are there to be driven, not looked at’, is a commonly held view amongst non-detailers: ‘I’m too busy. . . it’ll just get dirty next time it’s driven.’

Naturally, detailers would beg to differ.

Show and Shine competitions should only be concerned with the standard of detailing, compared to 'concours' competitions that also tend to award or deduct points according to the originality or 'patina' of the vehicle.

For a start, there is a financial reward from detailing your car. A well kept exterior not only looks impressive but hints at a higher level of maintenance overall, attracting a higher price and more buyers at sale time. Paint defects, typically corrected by the dealer during pre-sales preparation, will not need to be rectified, saving the dealer some costs (that may otherwise have been reflected in the bid price). In short, detailing helps combat depreciation. And even if the financial reward is minimal or largely irrelevant, a detailed car often 'feels' better, perhaps like a new car, or one you could love again. It could save you the expense of trading it in, or even encourage you to drive it more considerately.



Man versus paint: eliminating swirls is a hugely rewarding aspect to detailing; the battle is then to keep the paint 'swirl free'.

There is also a classic emotional effort/reward ratio with detailing that makes it an extremely enjoyable and satisfying hobby. Correcting paint takes patience, knowledge and skill. There are also many variables that can challenge the detailer throughout the process. Instead of man versus machine, it is man versus paint. The quest is a swirl-free, corrected paint finish that is glossy and long lived. Once the paint has been corrected – which is no easy or quick matter, in most cases – there is a never-ending battle against contaminants that all contrive to spoil the finish. Keeping the paint swirl free is the second part of the challenge.

Being in control of the process and products, and then seeing the improvements that result at first hand, has the potential to become addictive. Does the perfect finish actually exist? Would you be happy to settle for 85 or 90 per cent instead of perfection? Or do you chase out every swirl and spend every spare moment refining or maintaining the finish? The level of involvement (or obsession) is up to the participant. Just as hours can be spent in a snooker hall or on a golf driving range, hours can be spent with a machine polisher correcting paint, and improving skill levels and knowledge of the craft. Whether you detail once a year or every day, whether you correct paint or just wash off a month's worth of grime, there is an innate and fundamental appeal to detailing that looks set to continue well into the future. If spacecraft need cleaning, suffer from marks and scratches or lose their shine, detailing may remain a popular hobby in millennia to come.

Some may also find detailing therapeutic. It can be a calm, solitary pursuit with few distractions (after all, neighbours, partners or children rarely want to get involved for fear of having to help!) and even the high-pitched whirr of a rotary polisher may become more relaxing than annoying after a while. That's not to say that it can't be a social pursuit: detailing meets and shared details (with a friend helping to lighten the workload) are quite common, and indeed are often the only way to fully correct paint in a day. But detailing is generally a good source of 'me time', to use the vernacular of contemporary lifestyle advice columns, and that is no bad thing if you have a busy or stressful existence.

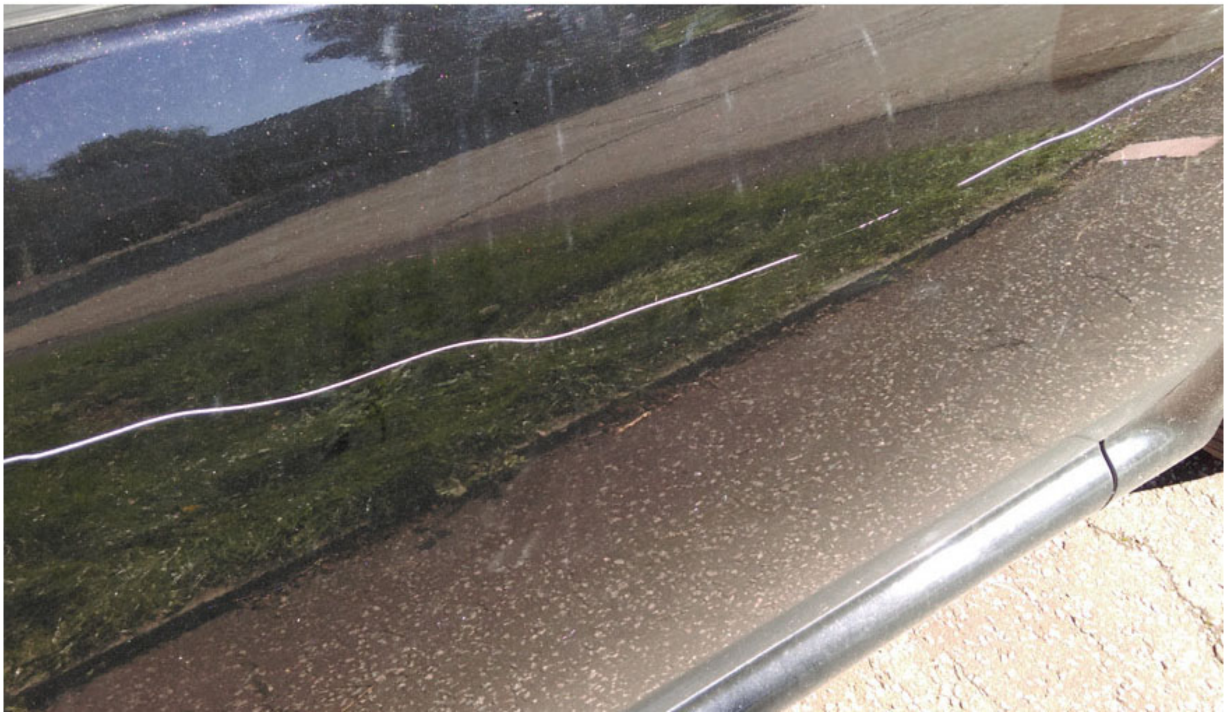
CHAPTER TWO

SETTING UP

EXPECTATIONS AND LIMITATIONS

Firstly, don’t expect this book to turn you into a detailing expert overnight. Whilst it should prove to be highly informative and instil some very useful principles of car care, detailing is as much art as science. It needs practice, experience and enough talent to nurture. But don’t worry – you will be a better detailer if you follow the recommendations and advice that follow. Expertise needs to be built on solid foundations, and this book will provide them. The confusion, conflicting advice, and incorrect or misleading information found throughout the internet will be neatly side-stepped. Does it provide better information? Maybe not. But it could take you a long time to cherry pick the necessary information online.

Secondly, detailing can only do so much. Heavy paint defects, such as deliberate key scratches, may only be improved rather than removed. Apart from a little localized paint application (to chips and suchlike), detailing doesn’t add permanent products to the surface and a respray could be necessary if detailing techniques prove unsatisfactory.



Deep key scratches may be impossible to 'correct' by detailing methods; they usually require paint repair of some nature.

It is also best not to expect too much, too soon. Whilst the techniques and processes described in this book are well within the skill levels of the average car owner, practice (and patience) will inevitably be required. Furthermore there could be some frustration if a technique is perfected on an isolated panel (or other surface) on just one vehicle: this is because paint types differ wildly, even between the same make and model of car, as these may be made in different factories around the world – so learning to correct the paint on your Nissan may not lead to instant success when correcting the paint on a Porsche. It will help, though. The process will remain fundamentally the same, but the products, techniques and time taken to complete the task may alter.

From a physical point of view, detailing isn't generally that demanding unless you are machine polishing. This can be back-breaking work, especially if a heavier machine is being used on the centre of a bonnet. Spreading a detail over a number of days makes the workload easier, psychologically as well as physically. Spend time in advance finding a technique that works on a small area, then tackle the rest of the job. . . in stages if there's an acre of paint to correct. And when you start to lose interest, stop, as this is when mistakes get made – and you won't be enjoying yourself anyway.

Cheap 'convenience' products applied regularly may be a false economy in terms of cost and effort. The shine and protection could be short-lived.

A full detail can usually be completed over a number of days without any ill effects (in technical terms), although cars left outside could become re-contaminated quickly. Never let a detail become so spread out that it becomes self-defeating, with a large amount of time having to be spent on repeating stages that have been previously completed. Try and establish a 'baseline' whereupon the car is detailed to a level you are happy with, then maintain that finish.

You can then re-establish that ‘baseline’ once or twice a year, or before a show, without exerting a lot of time or effort in between. A typical car owner using mass-market products of convenience may spend the same annual amount of time on his (or her) car’s finish by regularly applying cheaper products that don’t last very long. Two hours every fortnight for twelve months is roughly equivalent to a whole week of intensive detailing.

Financially, detailing is within everyone’s reach. A bottle of polish, an applicator and microfibre cloth are enough to create a dramatic improvement in the cosmetic appearance of a car, and could be purchased for just a few pounds. And a lower-end machine polisher currently costs no more than a single tank of fuel. Of course, enthusiastic amateurs and professionals can spend thousands on detailing products and equipment, but process tends to be more important than product – and a lot of the equipment is unnecessary for most detailers, most of the time. Indeed, a professional using less sophisticated, lower-end products could probably achieve better results than a novice with access to the finest detailing equipment and products known to mankind.

BASIC REQUIREMENTS AND EQUIPMENT

One of the most pleasing aspects of detailing as a hobby is that it doesn’t require a specialist environment (no track, court or field is needed) and that the equipment required is minimal – initially at least – and within any car owner’s budget. It’s a hobby that every motoring enthusiast can enjoy, and one that only starts to become expensive once machine polishing is involved, or the hobby becomes a profession. Even then, hundreds of pounds, rather than thousands, can furnish the detailer with equipment that can produce results at the highest possible level. Because we deal with specific equipment at each detailing stage throughout the book, we won’t be compiling an overly detailed or exhaustive list of what you may – or may not – need here. Budgets, interest levels and desired results will vary, and one person may feel ill equipped when another has more tools than he or she will ever use.

However, we realize it may be useful to attempt a basic inventory of ‘home detailing’ equipment and consumables, so we have compiled the following lists below.

THE BASIC INVENTORY

Even a modest assortment of equipment can lead to impressive results; the pressure washer (or ‘power washer’, or ‘jet wash’) is arguably the most important single piece of equipment in a detailer’s armoury, assuming the paint is in good condition.

An inventory of detailing equipment may comprise the following items:

- Hose and/or high-pressure washer equipment (this may include a foam lance assembly – *see* the ‘pre-wash’ stage later in this book)
- Hand-wash equipment: ideally two or more buckets and the sponges, mitts or brushes required for contact washing of bodywork, wheels and so on
- Drying cloths or equipment (this may include everything from the much maligned ‘water blade’ to hot-air drying systems)
- Clay bars/elastic polyclay media (clay mitts, clay pads) and clay bar lubricant (although these may better fall into a ‘consumables’ rather than an ‘equipment’ category)
- Hand-polishing applicator pads; wet sanding discs/paper (and block, if required)
- Electric machine polisher, various sizes of backing plates and machine polishing pads, masking tape and dust sheets (if required)
- ‘Swirl-spotting’ torch, halogen/LED tripod work lights and other light sources
- Wax/sealant applicator pads
- An assortment of various grades of buffing cloth, from ultra-soft microfibre cloths for final buffing of paintwork, to more aggressive types of cloth for polishing glass or exhaust tips; check the softness of edging and stitching as well as the main fabric, and always remove manufacturer’s labels or tabs
- An assortment of spray bottles, should concentrated products need to be diluted to strength and then used
- Detailing swabs for attending to badges, door locks and the like

There are thousands of specialist detailing products available to help the detailer in his or her tasks. Dedicated detailing products may offer more performance than multi-tasking alternatives.

Consumables required may then include:

- Traffic film removers and other pre-wash products
- Car shampoos (detergent, maintenance, gloss-enhancing or protective)
- Clay bars or equivalent clay media (fine, medium or coarse grades) and clay bar lubricant
- Tar removers, fallout removers and general degreasers/all-purpose cleaners

- Wheel cleaners, wheel sealants and tyre products
- Hand polishes, glazes and machine polishes (compounds)
- Waxes, sealants and other paint-protection products
- Glass polishes, cleaners and sealants
- Plastic trim cleaners, dressings and/or sealants
- Interior leather, vinyl, upholstery and fabric trim cleaners and sealants
- Specialist products, such as convertible roof cleaners and sealants

Remember, the above shouldn't be seen as a shopping list, but it does indicate what a detailer may end up acquiring in the full course of their hobby. Many high-street products try and consolidate tasks, for purposes of convenience; this may mean that one product suffices as a tyre and trim dressing, simplifying the inventory and decreasing costs. However, specific products for each task may offer more performance, so a considered approach needs to be taken.

CLOTHING

There's a simple rule for clothing: it mustn't snag or scratch. This means that zips, buttons, poppers and any other fasteners must not be in a position where they can come into contact with the paintwork. Generally, front-zipped clothing causes problems, especially when unzipped, but a half-zip fleece would generally have the zip high enough not to cause an issue. Take care with belt buckles and jean studs, to ensure they are protected by outer layers of clothing. Cuffs should be rolled up, or checked to ensure that they do not have features that can rub or scuff the surface being worked on. Also items of jewellery such as bracelets, rings and watches are best removed, as these could all come close to delicate paint – and being metal, the outcome of accidental contact is obvious.

Always wear snag-free clothing that won’t scratch.

Detailing can be a wet or filthy pursuit on occasions, so don’t wear your best clothes, although full wet-weather protection is largely unnecessary – and probably far too hot in practice. Just make sure that you can move freely and that the materials closest to the car are as soft and fastener-free as possible. There are even detailing aprons available, typically to guard against the splatter or ‘sling’ of wet compounds when machine polishing. These often have a handy front pocket, but they would hardly be considered essential. Old sweatshirts and fleeces tend to be cheaper and offer similar practicality.

Knee pads or a kneeling cushion may increase comfort when working on the wheels and lower parts of a car (some detailers will even buy a mechanics' rolling seat or 'creeper'). And whilst there may be some technical attraction towards using soft, thin cotton gloves to prevent finger and palm prints on paint, they are rarely – if ever – employed, even by professionals. Nitrile or latex gloves make far more sense, protecting hands from chemicals and dirt, whilst also preventing grease marks or fingerprints on clean panels. There is a limit to detailing attire. Common sense is all that is generally required, and avoiding unnecessary contact with the paint, whether in terms of skin or clothing, will eliminate potential problems.

SPACE AND LIGHT

It is important to be able to 'work around' a car during the detailing process, so ensure at least 1–2 metres of clearance. This may not always be possible in a small garage, so consider moving the car during the detailing process to create space, detailing outside if the conditions are suitable, or even detailing under temporary cover (for example, a sturdy and well-anchored gazebo).

Good lighting is essential. Use 'daylight' spectrum bulbs or light sources, if possible. The sun is a great light source, but ambient conditions (heat, humidity) may be less than ideal.

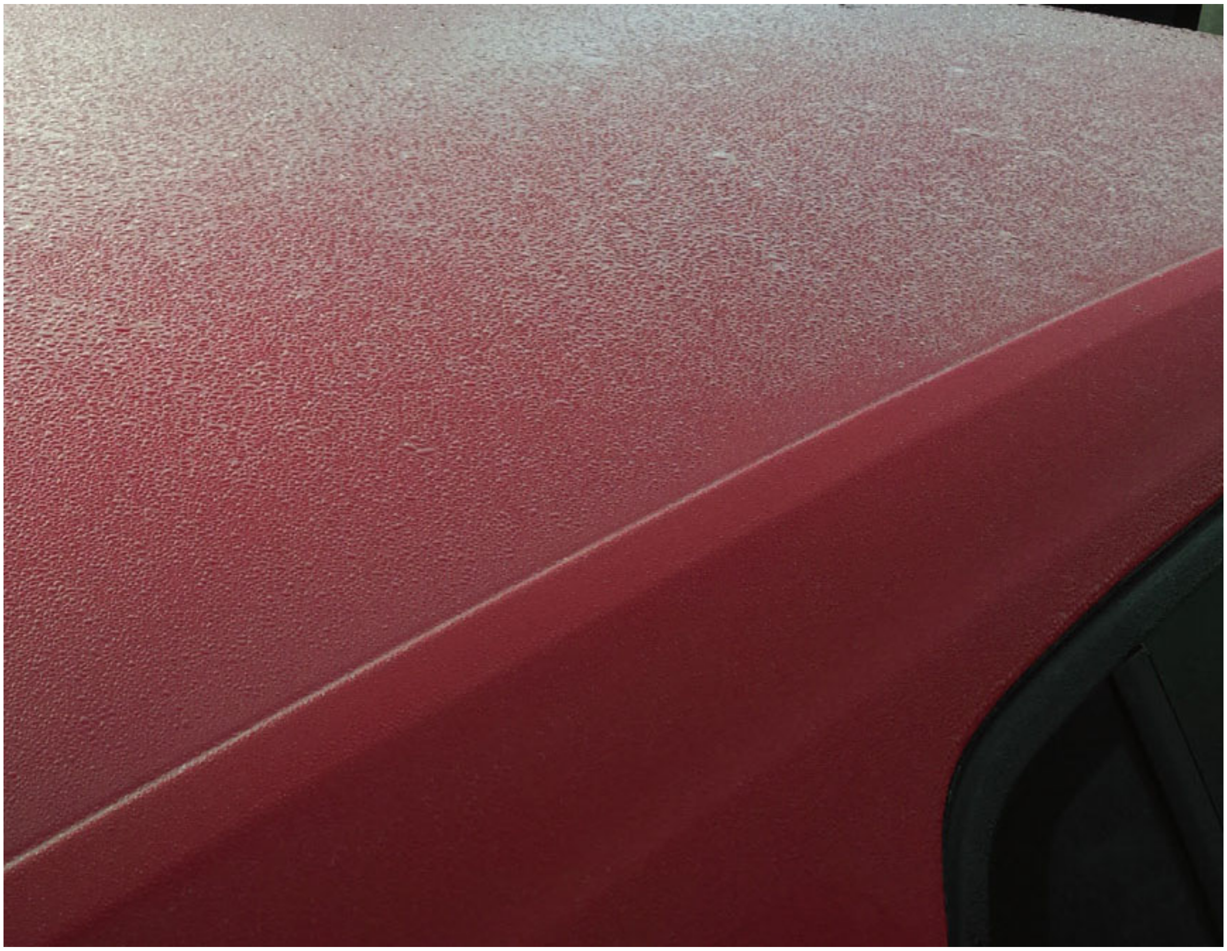
Natural light is ideal, but detailing outside can be problematic. Halogen or LED work lights are frequently employed, but note that halogens may run at very high temperatures – a bonus when working inside in winter, but not much fun in cramped conditions in summer. Fixed detailing lighting is often commissioned for professional detailing bays, usually metal halide lighting (for a high-powered 'white' light, in comparison to the 'warm' light given off by halogen bulbs), high-powered LED lights, or standard fluorescent tubes with 'daylight' tubes (not as intense a light source as metal halides, but much less expensive). However, these options could be considered an expensive luxury for hobby detailing. As much lighting as possible with white or daylight bulbs will generally suffice, especially if the walls and ceiling are painted white to maximize reflection.

AMBIENT CONDITIONS

There are two ambient factors that may affect the detailing process, whether detailing inside or outside: temperature and humidity.

Temperature is immediately obvious. Hot panels – whether heated by sunlight, halogen work lights or even the action of machine polishing – will cause products to behave differently in comparison to cooler panels. Generally, accelerated curing and decreased workability will be seen. Claying a hot bonnet in direct sunlight, for example, becomes extremely tricky – the clay lube will dry out far more quickly, preventing the clay from being able to move freely. Or if a protection product has been applied, it may cure far more rapidly than the manufacturer's guidelines dictate, making it more difficult to buff.

A very humid environment will have the opposite effect. This is not because the air is moister and therefore keeps products 'wetter' for longer, but because the water in the air prevents the solvents in the product 'outgassing' as fast as they normally would. This gives products longer cure times and more workability – and may also lead to some strange effects. For example condensation may form on the freshly detailed surface, often showing up as a fine mist on recently waxed or sealed paint. This occurs because surfaces cool quickly when solvents are outgassing on them, and the moisture in humid air then has an opportunity to condense.



Condensation may form on panels in humid or damp conditions, especially if they have been recently waxed or sealed, due to the solvents outgassing and therefore cooling the panel slightly.

Detailing outside at dusk or dawn, when temperature changes are more rapid and condensation even more likely to occur, is therefore best avoided. This effect is exaggerated in cold or wet climates, or tropical climates with high humidity. If the hot midday sun causes issues, and dusk and dawn are problematic because of the potential for condensation, this gives a very narrow window to detail outside in some parts of the world. A covered or fully sheltered detailing environment is therefore always going to be preferable, whether a simple gazebo to keep working areas in the shade, or a fully climate-controlled garage.

AIRBORNE CONTAMINATION

Detailing outside has a further disadvantage: the risk of airborne contamination is far higher. In extreme cases this could be in the form of cement dust or fence-stain droplets that drift in the wind from neighbouring properties. More commonly it means dust, pollen, tree sap and iron particles (‘fallout’). Whilst less hazardous to a painted finish than cement dust or paint flecks, these contaminants can still be obstructive to the detailing process, requiring removal prior to work being carried out, or even necessitating the repetition of a previously completed detailing stage.

Insects landing on bodywork can be annoying, but this is rarely a major detailing issue; they are attracted by the coolness of the panel caused by the application of water/detailing products, more than the colour of the car or the fragrance of attractivesmelling products.

Finally, there is the potentially annoying problem of flies and other insects landing on the car. Drawn to the coolness of drying bodywork, or the coolness of outgassing panels recently coated with curing products, they may also be attracted by heavily fragranced products or even bright paintwork. Settling on the car in their masses, these flying visitors may cause irritation to the detailer and disruption to the detailing process – but they rarely have any detrimental physical effect to the detailed surfaces. They are quite simply another reason to detail inside, as soon as practicality allows – once the pre-wash, wash and rinse stages have been completed.

SAFETY

Detailing is rarely considered a dangerous or risky pursuit – there are thousands more injuries sustained snowboarding or mountain biking than polishing the paint on a car. However, there are points of caution that should be observed.

Trip and slip hazards are common detailing dangers, but also watch out for strong chemicals, polishing dust and so on.

Firstly, water from the wash stages will present a slip hazard, and any electrical equipment such as halogen work lights and machine polishers must be kept away from buckets, and used only with circuit breakers.

Secondly, trip hazards will be plentiful. Cables for machine polishers, pressure washers and work lights will potentially run underfoot. Ideally, these should be taped down or placed inside flat conduit.

Also consider that certain pieces of equipment will have unique dangers. An ultra-hot halogen light may cause burns if the casing is touched. Orbital polishers may vibrate, potentially resulting in a loss of sensation in the fingertips if used for extended periods of time. Rotary polishers may entangle neck chains, long hair or loose clothing. Polishing dust may be dangerous if inhaled, and the noise of loud machine polishers may affect hearing. Even polishing the centre of a bonnet may result in a bad back, if a heavy machine polisher is used. Therefore, check the instructions for each piece of equipment carefully, and note the safety information before use.

Cleaning wheels should be carried out in a way that ensures the wind blows the product away from the detailer, rather than towards him/her.

Products can present their own risks, too. Whilst anyone with sensitive skin may struggle with stronger detailing shampoos, most detailers will only be troubled by the more aggressive product types – caustic traffic-film removers, acidic fallout removers, strong wheel cleaners and potent solvents for removing tar and rubber deposits. These can dry or irritate skin, and splash-back or overspray during application can be particularly unpleasant (and even potentially dangerous), whether in terms of contact with eyes or inhalation. Sensible precautions should be taken when dealing with stronger products, making sure that they are not applied ‘into’ the wind, for example, or applying them with nitrile gloves (and even a face mask and safety glasses, if required). Always read the label, and if in doubt, look for the manufacturer’s MSDS – the safety information they legally have to provide for hazardous products (usually via the internet).

ENVIRONMENTAL CONSIDERATIONS

Whilst there is already extensive legislation covering pollution created by car cleaning, whether on private land or on the highway and public areas, it tends to be a consideration of professional enterprises, such as commercial car washes and mobile valeters. The average car owner rarely gives it much thought. But we live in an age of ecological awareness, so it is good to be aware of your responsibilities, and how detailing can be undertaken with the minimum amount of environmental impact.

BEING FRUGAL WITH PRODUCTS

This little 30ml jar of wax can coat a car three to four times over, making it far more efficient and economical to use compared to a sprayable liquid.

Some mass-market products promise to enhance the gloss of paintwork, and even protect it, perhaps whilst simultaneously washing or cleaning your car. The convenience is obvious, but the down side is that regular application of the product may be required to ensure ongoing protection. Using a lot of product (one 5ltr sealant on the market lasts only twenty applications – a staggering 250ml of product per application) regularly could be far less ecologically friendly than applying a concentrated sealant after the cleaning process, where perhaps a tenth or twentieth of the product may be required for a similar (or greater) effect. For example, just 8ml of a concentrated sealant or advanced wax could protect an average-sized car for up to six months, and only a mild shampoo and detailing spray would be required for maintenance.

Furthermore, a higher concentration of chemicals is likely to end up in the storm drain with the ‘wash and shine’ product, and the increased packaging, transportation and storage of a highly diluted massmarket product could have a hidden environmental impact. An efficient regime, split into precise but carefully understood and calculated detailing stages, should allow the right products to be used at the right times, in no greater quantity than would be required to do the job in hand. This may result in better results and less cost over the course of a year – even though mass-market products invariably appear cheaper, and more convenient and time efficient at first glance – and prevent the unnecessary application of car-cleaning chemicals.

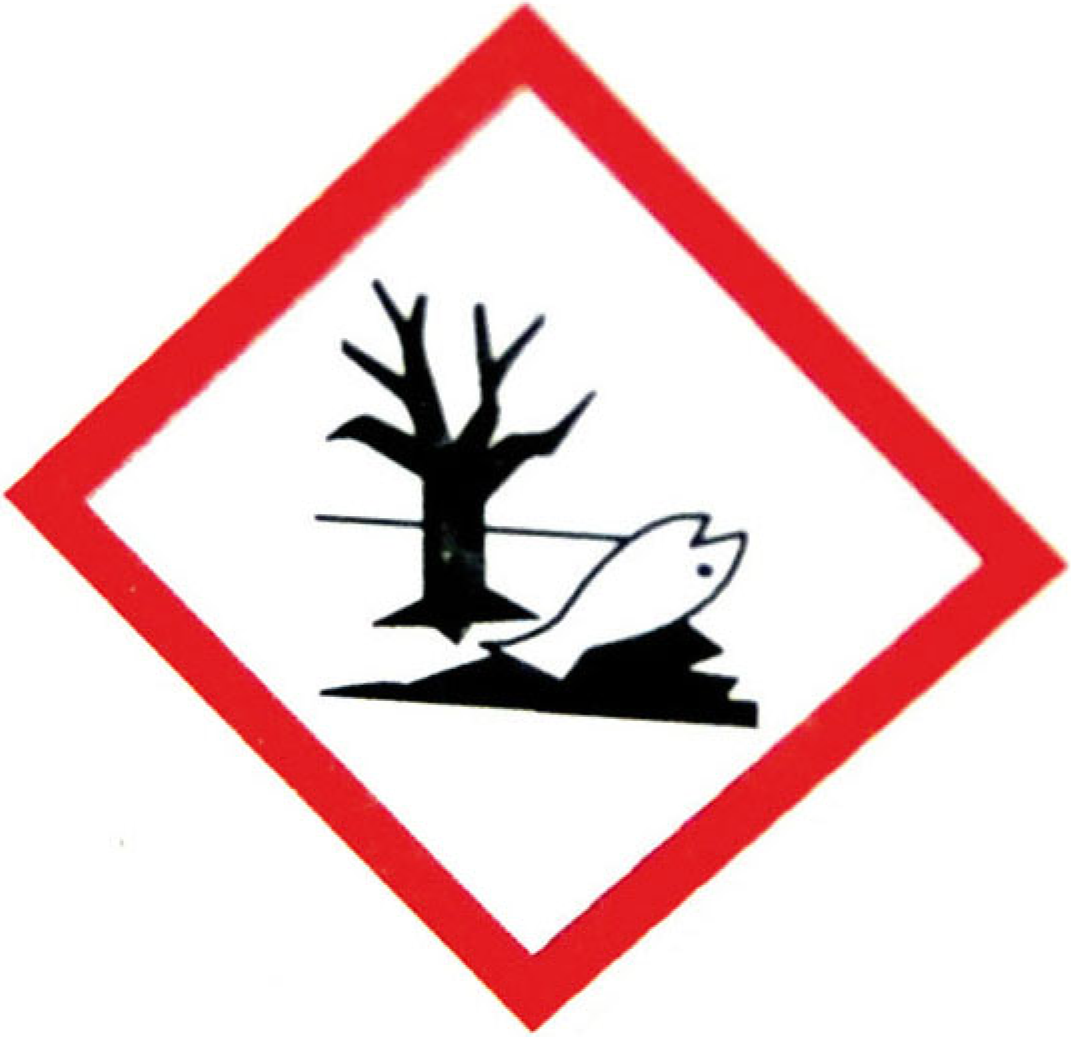
Understanding the products and processes themselves will also help. By sealing a wheel after cleaning it, all that may be needed to keep it clean over the coming months is plain water from a pressure washer or a mild biodegradable shampoo. Without this simple and relatively cheap ten-minute detailing stage, the wheel may be at far more risk of bonded contamination (due to brake debris and suchlike) and require the use of a much stronger wheel-cleaning product at regular intervals – something that may have been entirely avoidable.

AVOID RUN-OFF INTO STORM DRAINS

Any detailing run-off that flows into a storm drain will end up in the water course. This is not an issue if it is 100 per cent pure water, but it may also contain product residues and contamination removed from the vehicle (solvents, oil, grease, tar and so on).

Roadside drains – or ‘storm’ drains – don’t go into the waste-water system: typically they end up back in the water course. This means that you should always try and avoid run-off into these drains, especially if the detailing waste contains harsh chemicals, or heavy pollutants such as oil.

Remember, even if you wash a car with a pressure washer or steam (and therefore use water only in the detailing process), the waste created will contain all manner of contaminants lifted from the surfaces of the car, such as brake dust, engine oil, petrol and grease. So assess not only the detailing materials used, but also the contamination being removed, as the combination of these will dictate how polluting any waste will be. If it ‘runs off’ the car and isn’t contained, it will invariably be washed down a storm drain.



Products that contain ingredients hazardous to the environment will show this hazard pictogram, and need care in their use, handling and disposal.

Therefore, keep your vehicle well maintained (to prevent oil and fuel leaks), remove any ‘extreme’ contamination as far as possible before detailing begins (engine bay and underside detailing, especially), and assess the detailing products that you use. Milder biodegradable shampoos, for example, could be preferable to highly synthetic ‘sealant’ shampoos and caustic traffic-film removers. Stronger products should only be used where absolutely necessary, and with every effort to minimize and contain the residues created. Note that products specifically hazardous to the environment will generally be identified by a warning symbol showing dead fish and trees.

Empty unused shampoo solution into your sink so that it can be processed, rather than into a water course.

Professionals should consider using run-off containment devices, such as lipped mats and booms. These may also save water for filtration and recycling later, if water is scarce in the area at the time.

There is something that every car owner can do, however, at no extra cost and little extra inconvenience. Instead of emptying buckets containing unused shampoo solution into roadside drains, release the waste into the kitchen sink or a domestic soil drain (sewer). This ensures that the waste water gets processed and recycled, rather than being dissipated into the environment. Note that this should only be done for mild detergents: solvents and strong chemicals should never be emptied into domestic soil drains.

If there is unavoidable pollution, either soak up as much as possible with sand and dispose of it responsibly, or use dedicated cleaning chemicals/materials to neutralize the spillage, or dilute it with water if the product is water soluble and diluting the spillage will lessen the environmental impact.

GOING ‘WATERLESS’, OR STEAM CLEANING

Ironically, waterless washes tend to be water based; they are better described as ‘low water’ or ‘bucketless’ wash products.

Waterless wash systems generally use chemicals to clean the car, rather than water. The main advantages are that the waste should never enter storm drains as run-off (because the contaminants and residues are captured in cleaning cloths), and they either use less water or no water at all. Of course there are disadvantages: the chemicals may not necessarily be environmentally friendly themselves; the cleaning cloths need to be washed later (requiring water and detergents); the process may be incompatible with heavy soiling, such as thick mud; and there may be a higher chance of marring paint if the lubricants in the waterless wash aren't effective enough. Taking everything into consideration, though, it is arguably worth 'going waterless' for its ecological merits – but only if the soiling is 'light to medium'.

Steam cleaning is an even more attractive option. It uses water (in the form of steam) rather than harsh chemicals to release the dirt and grime from the surfaces of the car. The only environmental cost would be the electricity needed to heat the water to turn it into steam, the washing of cleaning pads or cloths afterwards, and the risk that any contamination dissolved in the steam could create a polluting run-off (although this run-off would be cleaner than if chemicals were also used, and some steam cleaning techniques may prevent run-off altogether). Being potentially the most ecological option of all, it certainly deserves further consideration, so we explore it in more detail later in the book.

CHAPTER THREE

EXTERIOR PAINTWORK

THE KNOWLEDGE

Even the earliest motor cars that chugged out of workshops in the late 1800s sported painted coachwork. Indeed, they were effectively horse-drawn carriages (coaches) that had dispensed with the horse and found an engine to propel them forwards. The horseless carriage was born.

Wood had been treated, coated and ‘finished’ for centuries before – often to the highest standards for coach-building – and this heritage of craftsmanship and materials would prove useful to the fledgling automotive industry. Indeed, the inherently flexible nature of wood perhaps presented its own challenges in paint development terms, compared to the hard surfaces of ships, steam trains and metal structures.

Paint is a versatile protective coating, but it is also subject to corrosion, contamination, defects and damage. It therefore needs protecting itself.

These nitrocellulose wood paints and alkyd resin ‘enamel’ metal paints would end up suiting this emerging automotive application perfectly, enhancing the appearance of these new conveyances as their popularity grew in the 1920s and 1930s, and protecting them from premature corrosion. What soon became clear, however, was that paint would mark, stain or scratch. The finish was never as robust as a metal or glass surface, and it would therefore require rectification, maintenance and protection to keep it looking its best, and to keep it commissioned as a protectant itself.

These early paint ‘feeds’ would contain oils, animal fats and waxes – similarly, advanced synthetic oils and waxes are used in products today – to provide a shiny and uniform coating that covers minor surface defects and reflects light more accurately. Whilst the history of paint and paint-enhancement/protection products may be of interest to a small minority, the *nature* of exterior painted surfaces – and information about the wealth of contaminants and defects that plague them – is of value to every detailer. Knowing that paint tends to be softer than the grit present in a muddy puddle, or that even the toughest modern clearcoats could be permanently etched by bird mess, widens the mind to good detailing process: be careful wiping mud off a car; remove bird mess as soon as you can.

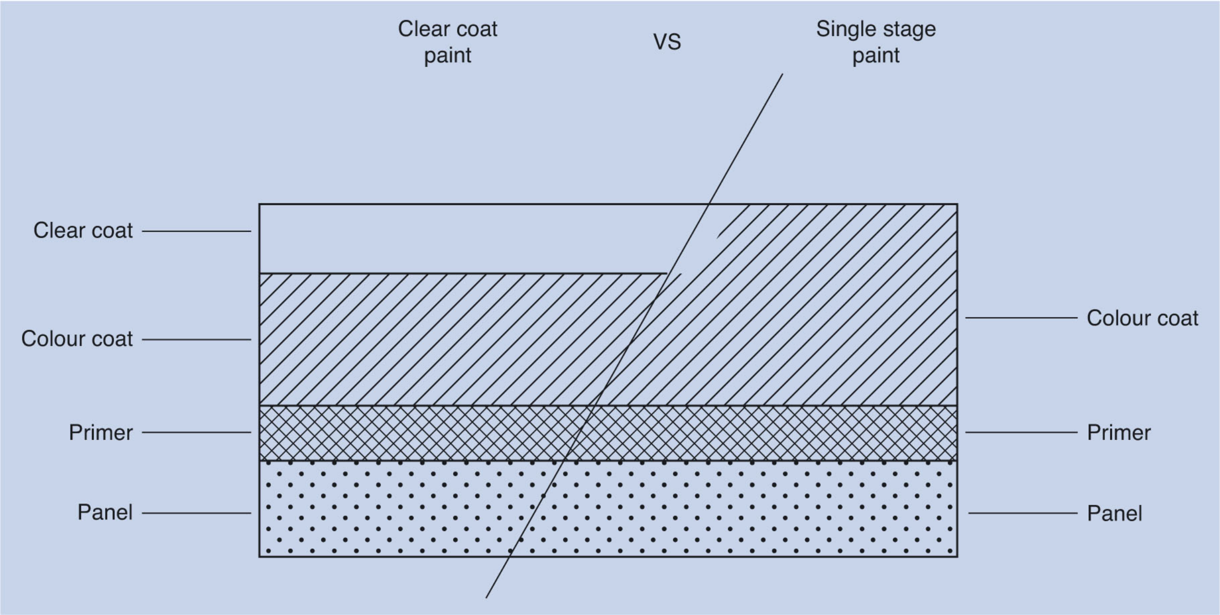
Let's start with paint – or at least the predominant exterior surface coating that most people would call 'paint'. Sometimes it isn't paint at all.

PAINT

Metallic paint is a sure sign that clearcoat is present as a top coat.

It would be convenient if the substance commonly known as ‘paint’ – that is, an opaque and coloured liquid coating – would adequately describe the finish found on every car. However, the most popular exterior coating for a modern car is actually ‘clearcoat’ – a clear lacquer or varnish – and there are also various resins and plastics, as well as paint and clearcoat, that could make up the main surfaces of a car. Note that we are only interested in the main surface, rather than the glass windows or the myriad of trim materials made from metal, plastic and rubber that may be found on the exterior along with the ‘paint’. These surfaces are dealt with separately, later in the book.

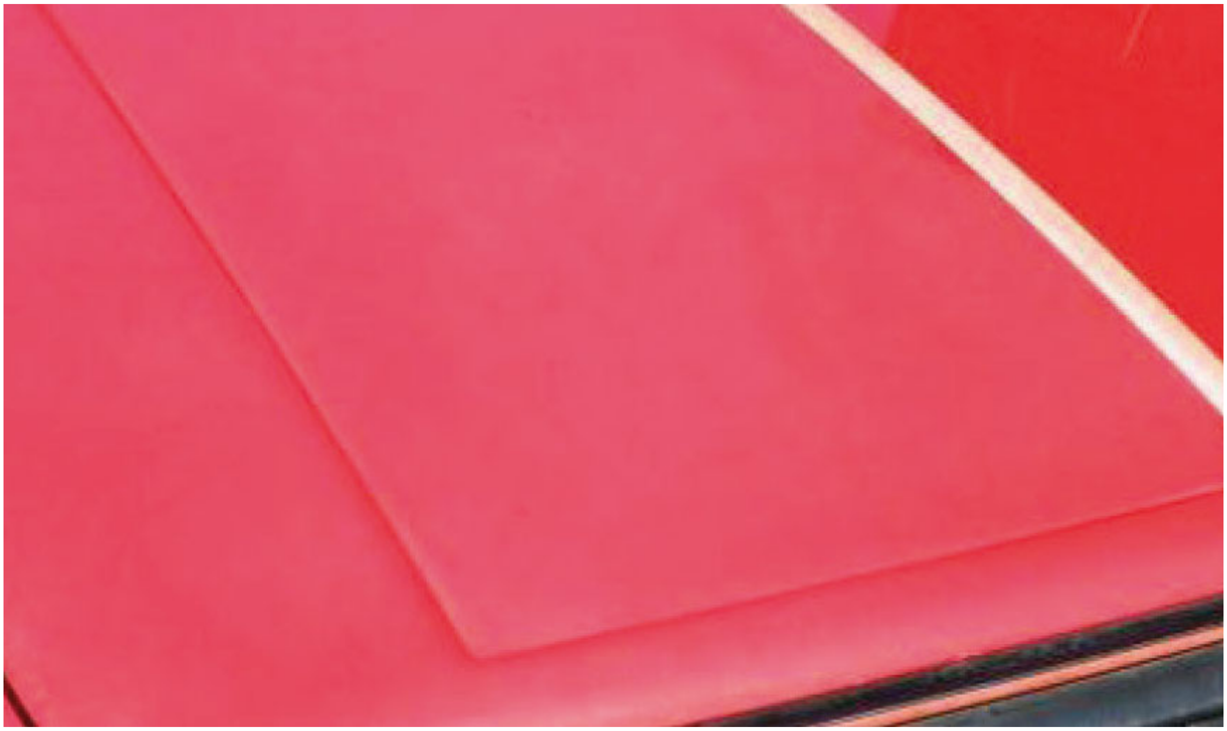
PAINT: COLOUR COAT, BASE COAT, GLOSS COAT



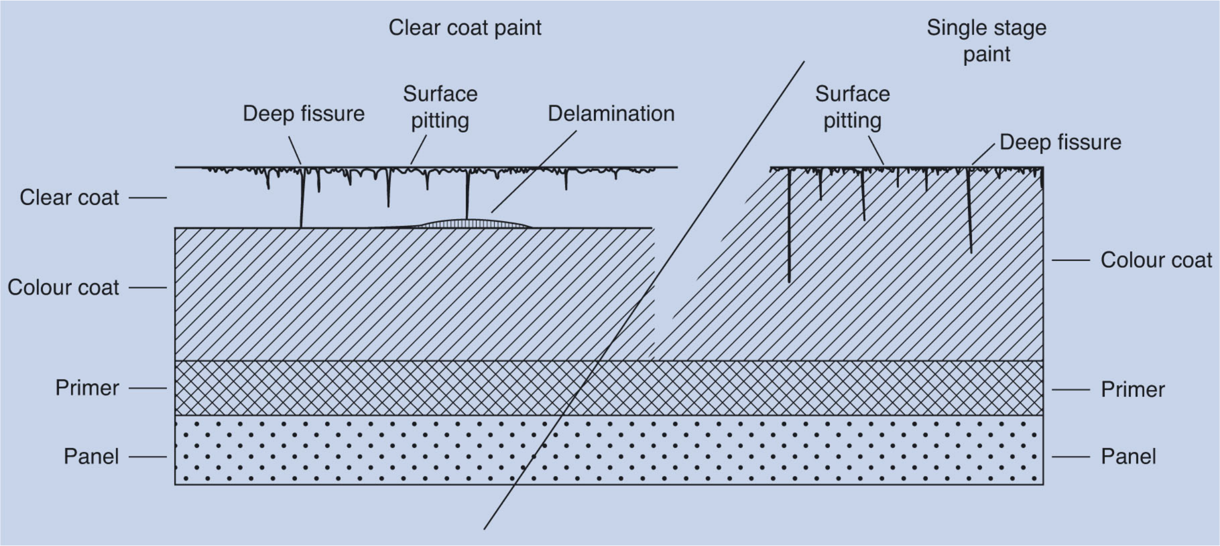
Paint types.

Whilst there will be a primer and even body filler beneath the colour coat, these will never be visible (although in theory, deep paint damage could still reveal them) and should never need the attention of a detailer. We will therefore ignore these preparatory products and concentrate on the upper, visible surfaces only. The colour coat (sometimes referred to as a gloss coat, or a base coat if a clear lacquer is sprayed on top) is the classic finish – the pigmented opaque coating – that everyone identifies as 'paint'.

It comes in multiple forms (solvent/water-based, ready-mixed/two-pack and so on) but all we are concerned with is, firstly, whether it is the uppermost 'top' layer, and secondly, whether it is 'hard' (this affects the ease with which it can be marked and the rate at which it can be corrected). If it is the uppermost layer, then there is no clearcoat to serve as additional protection. This is common on older 'classic' paints and a few modern non-metallics, most notably reds, whites and blacks from the 1980s and 1990s. The benefit of a colour coat upper layer is that there will generally be a lot of paint to 'play with', perhaps 80–90 microns (or more) in thickness terms. If typical wash marring is one or two microns deep, this gives a lot of scope for correction before the paint is 'struck through' and irreversibly damaged.



Red paint may turn pink when UV damaged, due to the light diffusion from thousands of microscopic cracks and fissures on the damaged paint surface.



UV paint damage.

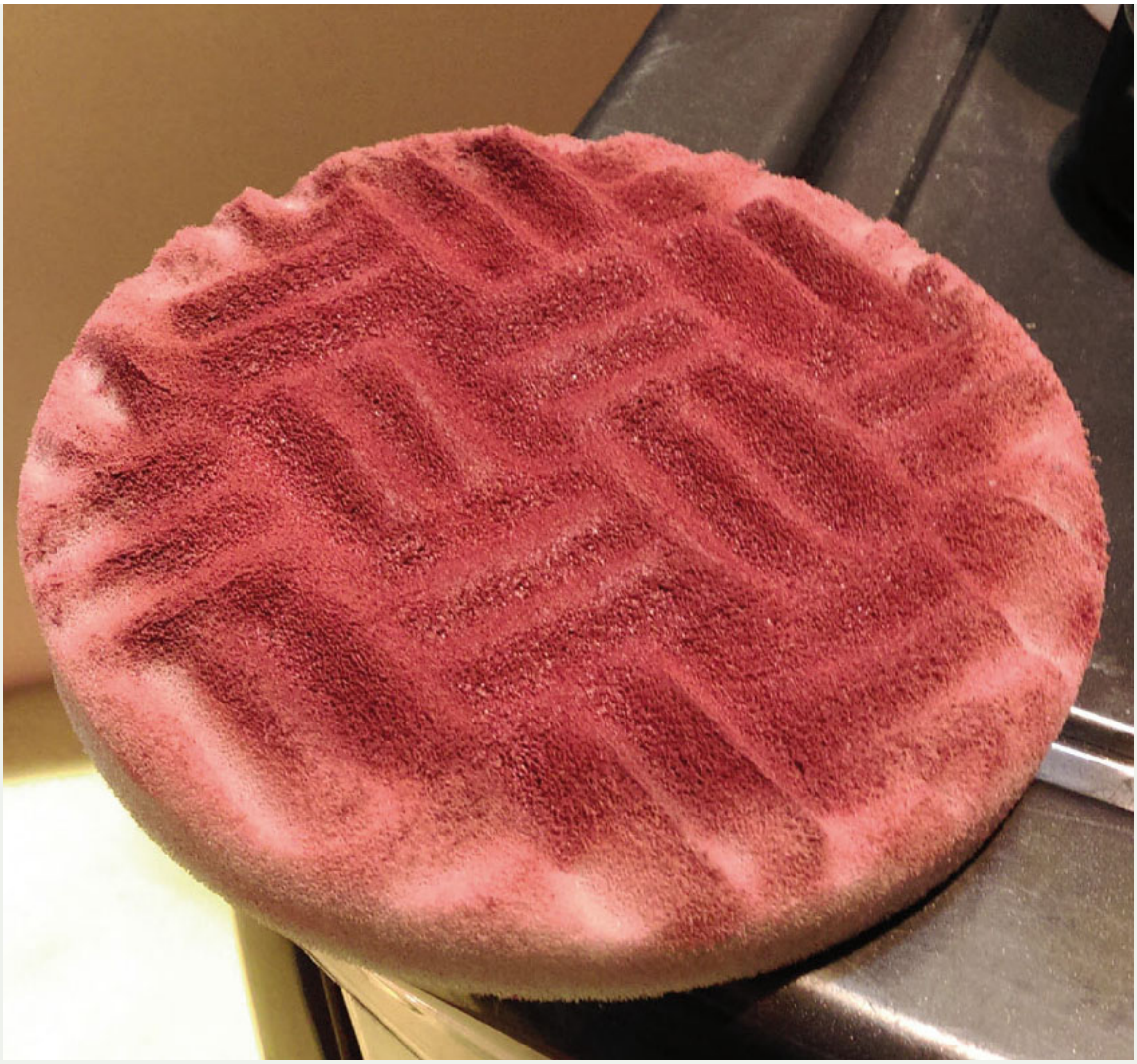
It's not all good news, though. Firstly, these 'single stage' or 'solid' finishes – where there is no upper (second stage) clearcoat layer – are now relatively rare. And secondly, they are rare for good reason, because they tend to be less scratch resistant and suffer from a greater degree of sunlight-generated UV damage compared to the more advanced clearcoated finishes (because the clearcoat acts as a UV filter). Red colour coats are particularly prone to this type of damage and will become 'porous' in nature if the damage has been sustained over a number of years. A decade of sun damage creates microscopic fissures and pores, resulting in a cracked and rough finish that looks pink (red colour coats) or grey (black colour coats) instead of the original colour. Old whites will tend to become very flat or dull, or even yellow because of dirt ingress into the damaged surface.

The sun damage can be deep – potentially dozens of microns – and may not be easily rectifiable (or rectifiable at all). Worst of all, this porous surface could extend deep beneath the surface, making correction arduous. And if oily products have been used to saturate the surface back to a deeper colour, these will be very tricky to remove should any repainting prove necessary.

So how do you know if the colour coat is uppermost? Well, if it is a modern and original manufacturer's metallic finish then it will invariably have a clearcoat upper layer (single-stage metallic finishes are extremely rare and only found on a small selection of classic cars). But if you have a red or black car from the 1980s or 1990s, then a colour coat upper layer is much more likely. You can test the paint yourself using a light- or medium-abrasive polish applied to an inconspicuous area: if you rub the paint and the colour transfers to the buffing pad or cloth, then the pigment transfer indicates the presence of a colour coat.

Clearcoats will dust (the clear dust appears white), but colour coats will give up their colour. Red residue on pads used on red cars is a tell-tale sign of a colour coat upper paint layer – or accidental strike-through if the paint was clearcoated. Note that a strong solvent such as toluene could be used instead of a polish to test the paint, but the risk of severe paint damage is high, so it is not recommended.

IDENTIFYING YOUR PAINT TYPE



Solid red paint will transfer to a polishing pad or cloth if an abrasive process occurs. Clearcoat merely dusts and no colour transfer takes place.

If you are not sure as to what paint type you have, find an inconspicuous area (say, on the wing inside the bonnet) and use a mild polish to rub a small patch of the paint. If you see colour transfer on to the pad or cloth, then it is likely to be a singlestage paint (you will also see colour transfer on to machine polishing pads, if operating a machine polisher). To see how *delicate* the finish is, buff off all the polish and then take a mild solvent and rub the same spot. Again, see how much colour transfer takes place. Classic solvent-based finishes may continue to stain the pad or cloth, whereas twopack finishes should remain more resolute.

Remember this is just a rough guide and doesn't surpass proper research, such as checking with the manufacturer or a professional spray shop. Remember that whilst clearcoats will not show colour transfer, they may be 'struck through' accidentally if the test is too aggressive, and then colour transfer *will* take place.

PAINT: CLEARCOAT, TOP COAT

Stone chips are more common with harder clearcoats, but these paint finishes will scratch less easily.

Technically, clearcoat – the uppermost coating found on most modern cars – is not a paint at all, because it contains no pigment. It is a clear lacquer – a varnish, in layman's terms – that protects the colour coat (or so-called 'base coat') underneath and gives a glassy finish. Originally used to lock in metallic particles in early unstable metallic paints, it is now commonly used on all manner of paints, including non-metallic reds, blacks and whites – some of which will be deliberately 'flat' or dull to aid adhesion of the glossy top coat.

Benefits? Well, clearcoat protects the underlying paint finish from the sun (and therefore limits the UV damage that tends to result), it can give a very glossy final finish, and it may also offer extra resistance to scratches. The disadvantages are twofold: there doesn’t tend to be much of it – a typical car may have 30–40 microns of clearcoat as the uppermost layer, increasing the chance of accidental strike through – and higher scratch resistance may mean a propensity towards stone chips (softer paints yield rather than fracture).

PAINT: MATT FINISHES

Matt paint finishes are fashionable but difficult to maintain; they can’t be polished and may become ‘smeary’ if standard car-care products are used.

Most matt finishes are the result of temporary vinyl films applied to the paintwork, rather than an actual permanent matt paint finish. Careful inspection of shut gaps, panel edges and trim surrounds should reveal whether the matt finish is paint or film. If the matt finish is painted, it can be treated like a standard colour-coat paint. Note that it should never be polished, or it will lose its matt characteristics. It can, however, be protected and maintained (although there may be a risk of increased gloss).

PAINT – LAYERS OF CONFUSION

Paint is as wide and confusing a subject to the layman as polish or wax, perhaps even more so. There is a raft of terminology, and some of it overlaps or is used to describe different things. What a detailer needs to bear in mind is that none of it ultimately matters if you can identify the hardness and thickness of the paint. That is all the information needed for correction, and this can be gleaned via inspection of the panel far more easily than relying on assumptions or generalizations. However, in the interests of clarity, we will attempt to clear up some basic misunderstandings regarding paint.

Two-pack versus two-stage: Some paint terminology describes how the paint cures, whether it dries via solvent loss, or has a second chemical hardener added to instigate the process. Two-pack paints, known as ‘2k paints’, use this two-stage process. . . but ‘two stage’ commonly refers to a sprayed clearcoat over a colour coat, and is nothing to do with paint hardener at all.

Cellulose versus nitrocellulose versus enamel versus acrylic: Technically, the earliest automotive paints were nitrocellulose solvent-based products, before being commonly replaced by alkyd resin (‘enamel’) and acrylic coatings – also solvent-based – in the 1950s and 1960s. Because they were all ready-mixed solvent-based products prone to fading and solvent attack, and all are generally found these days on classic vehicles, detailers tend to erroneously refer to all of them as being ‘cellulose’. It makes little difference in real terms, of course, as paint must be tackled as you find it. As an aside, the next major paint development beyond ‘cellulose’ – worthy of being treated as a new class in itself – is two-pack, or 2k, paint. These are extremely hard polyurethane or acrylic urethane paints that require a separate hardener to set, like an epoxy adhesive. Isocyanate two-pack paint is, however, marred by environmental and health issues, meaning that most modern paint systems are water-based (in whole or in part, as an overall process).

Hardness of different paint types: In general terms, modern clearcoated finishes tend to be the glossiest and the hardest (although there are notable exceptions – Japanese cars may often have particularly soft clearcoat finishes). Note that these are rarely water-based, despite manufacturers changing over to water-based paint systems for ecological and health/safety reasons; the colour coat beneath is likely to be water-based, not the clearcoat (a waterbased paint could be softer, but it does depend on its constitution and how it has been cured).

Ceramic clearcoats are potentially the hardest coating of this type, with self-healing clearcoats amongst the softest. Next up comes ‘solid’ twopack paint (that is, a two-pack paint that hasn’t had a clearcoat). This is often quite hard and reasonably scratch resistant. It may be softer than a ceramic clearcoat, but it could be harder than softer clearcoats. After this, you may have a water-based colour coat. These are generally softer than the 2k clearcoats and colour coats, but you’ll rarely find one sitting as the upper layer of paint on a car.

Finally, in softness terms come solvent-based ready-mixed paint types (often ‘cellulose’ finishes on classic cars), which may have initially offered a good finish, but could now be quite porous and brittle after decades of UV exposure (and highly susceptible to solvent interference). ‘Rattle can’ repair paints are perhaps the least stable and softest coating of this type, especially if applied by an amateur and without good preparation or ‘keying’.

Solid versus single-stage versus 1k: If 2k (twopack) paint refers to the paint system requiring a hardener for curing, it could be deduced that 1k paint needs no such additive (and is therefore ready mixed). ‘Single stage’, however, refers to the way the paint lies on the panel, not how it is mixed. Single-stage paint has no clearcoat over the top, and because the colour coat has a solid content in the form of pigment, or has a ‘solid colour’ all the way through, this type of paint finish is sometimes referred to as ‘solid’. To confuse matters further, the ‘solids content’ of paint can refer to its overall hardness, and single-stage paint finishes always go on top of a primer coat, so ‘single stage’ is a technical misnomer anyway. Non-metallic paint may also be referred to as being ‘solid’. Needless to say, confusion abounds, and rarely do so few words have such a wide variety of potential meanings and uses.

Primer versus base coat: Whilst it sounds as if the base coat would be the undercoat or primer, this actually refers to the colour coat in the context of a two-stage (clear-over-colour) finish.

Flat versus solid versus non-metallic: Paint or clearcoat that has been rubbed down and is non-reflective is referred to as ‘flat’. Presumably because flat paint has a lack of gloss, it could also refer to a non-metallic finish (for instance a flat red instead of a metallic red). ‘Solid’ is also used as a term to describe non-metallic finishes, as well as single-stage paints.

All the contradictions and confusion makes paint a mysterious and misunderstood subject. Perhaps sticking to ‘clearcoated’ and ‘unclearcoated’ as descriptions, and ‘metallic’ versus ‘non-metallic’ would make matters simpler. However, as has been mentioned earlier, it makes little difference to a detailer: it is the thickness and hardness of paint or clearcoat that are important, and these need to be assessed on an individual basis.

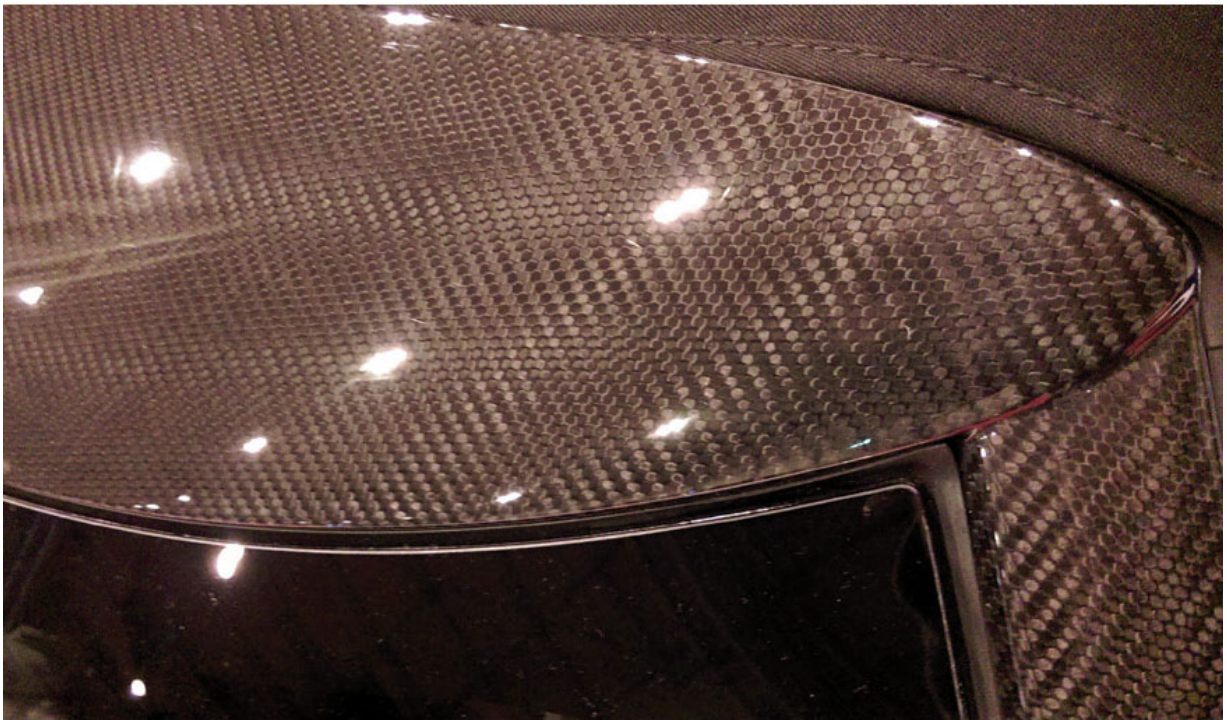
OTHER EXTERIOR COATINGS

GELCOAT

Gelcoat is a paint-like coloured resin. It is not quite as glossy or versatile in finishing terms compared to paint, but it is hard-wearing, economical and practical.

Gelcoat is a pigmented polymer resin that gives glass fibre (GRP) a glossy, smooth and coloured upper surface. Instead of being sprayed on, like paint, it is poured into the mould during the production process. This results in a relatively thick coating that can either be painted or left as the final finish. Because it is a relatively soft, plastic coating (like paint), it can be marked in a similar way. Thankfully, it can also be machine polished and even filled to enact a repair. As a surface finish, gelcoat is relatively soft compared to the hardest modern clearcoats. Note that it is predisposed to sub-surface cracking and fatigue in a manner alien to painted finishes (usually from panel stresses or stone impact from the underside of the panel – 'star' cracking is often seen). However, gelcoat damage can be filled and the area re-polished to make it good again (or as good as it can be).

CARBON FIBRE



The quality of coated carbon-fibre finishes may vary enormously, exacerbating the problems that can be encountered (such as lifting, flaking lacquer). Good quality coated carbon fibre can be successfully corrected and polished, like paint.

Like gelcoat, carbon fibre is made from resin-reinforced fibres. It is a lighter material than GRP (glass reinforced plastic) and has a clear resin (or 'lacquer') instead of a colour-impregnated gelcoat as its finish. Typically, this lacquer is quite thick and has similar characteristics to a soft/medium hardness clearcoat. It does tend to suffer from a couple of problems, though. Air bubbles and general unevenness are common defects (the lacquer often follows, or sinks into, the weave) and these will be difficult to remove through sanding or polishing. The lacquer can also 'lift' from the fibre surface relatively easily, resulting in a milky effect (this cannot be polished out and will require extensive restoration).

And finally, UV degradation of the lacquer is much more prevalent than with other materials, perhaps due to the dark carbon weave readily absorbing the sun's rays.

The manner of treatment is similar to that of paint: minor swirls and scratches can be sanded or polished out, but the more severe defects (bubbling, unevenness, lacquer lift or flaking) will generally be beyond the scope of detailing and require professional repair – or replacement of the affected part(s).

VINYL AND PAINT PROTECTION FILMS

Vinyl is a popular addition to modern car bodywork. It can, however, scratch easily, fade, and lift at the edges.

By ‘vinyl’, the reference is normally to a self-adhesive plastic coating applied to the paint surface for protection purposes (‘paint protection film’ or ‘PPF’) or for cosmetic/advertising purposes (temporary colour changes to cars, race-car livery, sign-written vans and so on). It is rarely a reference to the vinyl roofs of convertible cars or the thick (often textured) vinyl panels applied to the bodywork of a 1970s or 1980s car for reasons of fashion.

Vinyl film is a soft material and tends to mar as easily as the softest paints. Care must therefore be taken when preparing or maintaining the finish – and if the vinyl is an unlaminated colour print, extreme care must be taken as the colour print could be partially or totally removed with aggressive techniques or products.

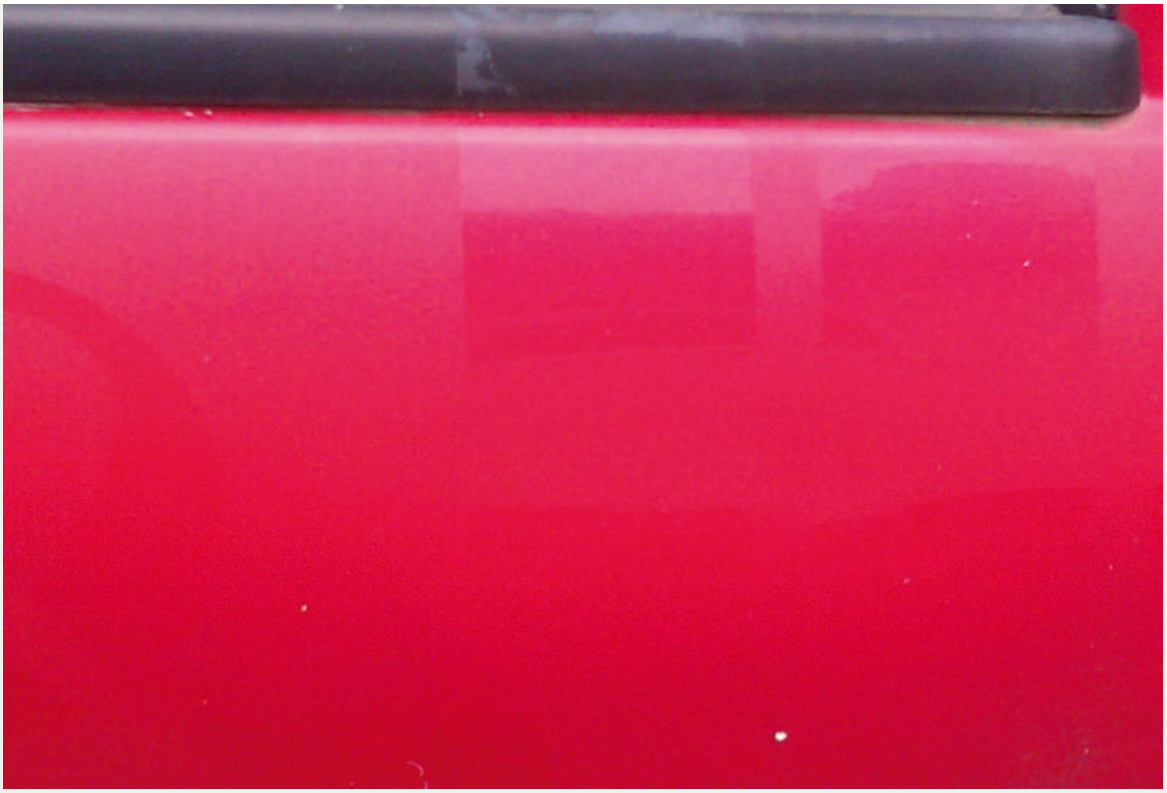
Thankfully, most vinyl tends to be either a laminated print (meaning that a clear layer of vinyl protects the colour-printed layer underneath) or a solid layer of coloured vinyl (rather than a printed colour). Whilst swirls or light defects can sometimes be removed using a strong solvent, this is not recommended unless a manufacturer specifically issues instructions regarding correction in this way. The chance of permanently damaging the film is arguably higher using strong solvents than using ‘soft paint’ swirl-removal techniques at low machining speeds and pad/panel temperatures. Note that one innovation with PPF coverings is a technology that allows for ‘self-healing’ of swirls and marks when hot water is poured on to the coating – this is unique to a specific type of film so does not apply to all PPF films or vinyl coatings, but it obviously has huge appeal for detailers.

Despite marking easily and being somewhat prone to fading – even the most durable laminated coloured vinyls may start to fail after just seven years – the biggest issue with vinyl coverings is probably the fact that all vinyl and paint protection films have a ‘stuck edge’. Whilst adhesives can be effective, they can only do so much, especially if the vinyl is cut into thin or delicate shapes that could easily be lifted. It is therefore advisable to take the following precautions:

- Be particularly careful cleaning around the edge of a vinyl film
- Use pressure washers with caution, at a distance from the stuck edge, and at 90 degrees to it where possible
- Never use strong solvents on vinyl film (unless specifically advised by the manufacturer), and certainly never near the edges where it could help to cause lifting – aggressive solvents could permanently damage the film or soften the structure enough to result in discoloration/yellowing caused by dirt ingress
- Never use anything but the softest abrasives and clays on vinyl coatings as there is an obvious marring risk
- Machine polish vinyl films with caution – stuck edges may need to be taped up, polishing media should be fine, and working temperatures should be low. Even if the stuck edge remains firmly in place throughout the life of the vehicle, residue (whether road grime or polish) may collect at the edge and be unsightly

Other issues include the risk of deep scalpel-blade damage to the paint during the vinyl trimming process, and a difference in underlying paint finish due to uncovered paint areas suffering from a higher degree of UV damage than covered areas (this tends only to be noticeable on partially covered cars when the vinyl sections are removed). Needless to say, the increased protection offered by a thick vinyl sheet stuck to a paint finish may far outweigh these disadvantages. Stone-chip protection is superb on frontal areas with vinyl applied, compared to areas of ‘naked’ paint.

REMOVING OLD VINYL FILM



Removing fresh vinyl is relatively easy and unlikely to damage the paint underneath; old vinyl is another matter, however, and paint fade to uncovered areas may have occurred.

At some point, it may be necessary to remove vinyl stickers or film. If the film is relatively fresh and has been applied to a mature clearcoat finish, there may be little issue. Simply use a heat gun (or hair drier) to soften the adhesive at the sticker edge, and pull the vinyl away from the paint carefully (although never use too much heat because paint could blister or peel, especially if it is old or damaged). Use a solvent or tar and glue remover to clean the area afterwards.

If, however, the film was applied a long time ago, the paint may have faded at different rates and be darker or glossier underneath the vinyl. Machine polishing may be required to restore the paintwork to a consistent finish, perhaps extending to machining the whole vehicle if the machined area fails to 'blend' successfully. There is also a chance of scalpel damage near the film edges, due to sharp blades being used during trimming; the cuts in the paint may be too deep to machine polish out and may require touching up or a localized respray. Old films may also have become brittle, tearing easily and therefore impeding removal. Finally, film applied to soft or freshly applied paint could pull the paint off the panel entirely during removal – a serious issue.

In summary, consider yourself to be fortunate if no paint rectification is required after the removal of vinyl film or stickers from paintwork.

VINYL (MATT FINISHES)

Matt vinyl finishes are notorious to maintain, but at least the vinyl can be removed easily if the owner tires of the finish; use a residue-free shampoo and glass cleaner to keep it clean.

Matt vinyl wraps combine the most challenging characteristics of vinyl wraps and matt paint. They have a relatively soft finish and can be easily marked (like gloss vinyl coatings), yet the matt surface will smear readily if it comes into contact with glaze oils, it may be damaged by abrasive ingredients in products, and in general terms, it is going to be tricky to maintain (like matt paint).

It is wise to observe the general points of advice above regarding vinyl, but the notes about claying and polishing should be ignored. Indeed, the application of any product, apart from residue-free shampoos or cleaners, should be avoided with matt vinyl finishes. A wax polish – or even a quick detailer – could smear the finish or add patches of gloss.

The fussiness of matt vinyl wrap, and its incompatibility with many product types and processes, makes it problematic to detail and maintain. In most instances, less is more. A residue-free shampoo and mild solvent cleaner are all that is required.

SPECIALIST FINISHES

Car manufacturers are getting more adventurous in their choice of exterior finishes, and occasionally, panels of stainless steel, naked (unlacquered) carbon fibre, bare aluminium – or even wood – may be encountered. Due to the widely differing nature of these materials, plus the likelihood of them being relatively sensitive or easily damaged, generic advice will not be given here. Suffice to say, specialist finishes should be assessed fully before they are treated, with information sought from the dealership or manufacturer, if required. A thin stainless-steel panel may look similar to one made from brushed aluminium, yet the methods of cleaning, polishing and protection may vary greatly. Mistakes could be costly, so always assume that a specialist material has a softer, more sensitive finish until you find out otherwise.

CONTAMINATION TYPES

Whether a car gets driven or sits in storage, there is a certainty that it will pick up some form of contamination. This could be visible, such as mud, tar, bird mess or insect debris, or it could be near invisible, such as dust or iron fallout. In all cases, surface contamination can – and should be – removed; gloss levels will improve with less detritus on the reflective surface, and products applied to the paint surface can work more effectively. Note that removing contaminants is much easier than repairing damaged paint and can often lead to the most dramatic improvement in overall appearance. It should therefore never be underestimated in the detailing process.

Decontaminating paint is also an important precursor to the polishing or protection stages in case contaminants are ground into the paint surface, or sealed into it, so understanding the contamination types and the best ways to remove them is essential.

We have categorized contamination types below, and will explore their removal methods over the forthcoming pages.

MUD AND DIRT (GRANULAR DEPOSITS)

Mud can contain granular deposits that may present a risk to paint.

Mud and dirt tend to be the most visible and unsightly form of contamination. The good news is that it can generally be removed from bodywork easily because it is loose rather than sticky in nature – although it can be more stubborn to remove if it dries on to paintwork because of high ambient or panel temperatures, or simply because it has been left to dwell for a long period of time. The bad news is that it is ‘heavy’ contamination, and will rapidly soil wash water or cleaning cloths. It is also extremely granular in nature, containing large and often extremely hard particulates. Small fragments of stone or sand can damage paint severely due to their angularity and comparative hardness, so it is important to remove these deposits as far as possible at a pre-wash stage, and to avoid any kind of contact with the paint if they are still present.

GRIME AND GREASE (VISCOUS DEPOSITS)

Grease can be difficult to remove, but is less likely to mar paint.

Grime and grease are sticky forms of contamination, and unavoidable on motor vehicles due to the prevalence of fuels, oils and lubricants within the car itself and on the roads. These viscous deposits are sticky and cling to paint, and resist flushing with plain water (solvents are usually required to remove them). However, despite being relatively difficult to remove, they tend to be low in large, hard particulates and are therefore less likely to damage paint during the cleaning process. Sun-cream handprints on body panels would also fall within this category.

DUST AND DEBRIS (UNBONDED DEPOSITS)

Any loose deposits that land on the surface of the car (generally referred to as dust or debris) will be the easiest contamination to remove. The particle size and softness will dictate how much risk is presented to the paint. These unbonded deposits could be from the surrounding environment (such as leaves and twigs, plant or tree pollen, or dust in a garage), or from the detailing process itself (such as dusty polish residue). Particular care must be taken with machine-polishing ‘heavy cut’ compound dust due to its highly abrasive nature.

TAR AND RUBBER MARKS

Tar is a common contaminant, and is best removed with a solvent.

Flecks of tar kicked up from the road are a real nuisance in the summer months. Rubber marks may also be found on the bodywork due to contact with rubbing strips on other vehicles or from tyre marbles (small rubber blobs expelled from soft tyres, usually on track days). These are stubborn forms of contamination but will be removed easily with solvents, and are also unlikely to damage paint (although tar left on soft or fresh paint for an extended period of time may discolour it).

INSECT DEBRIS

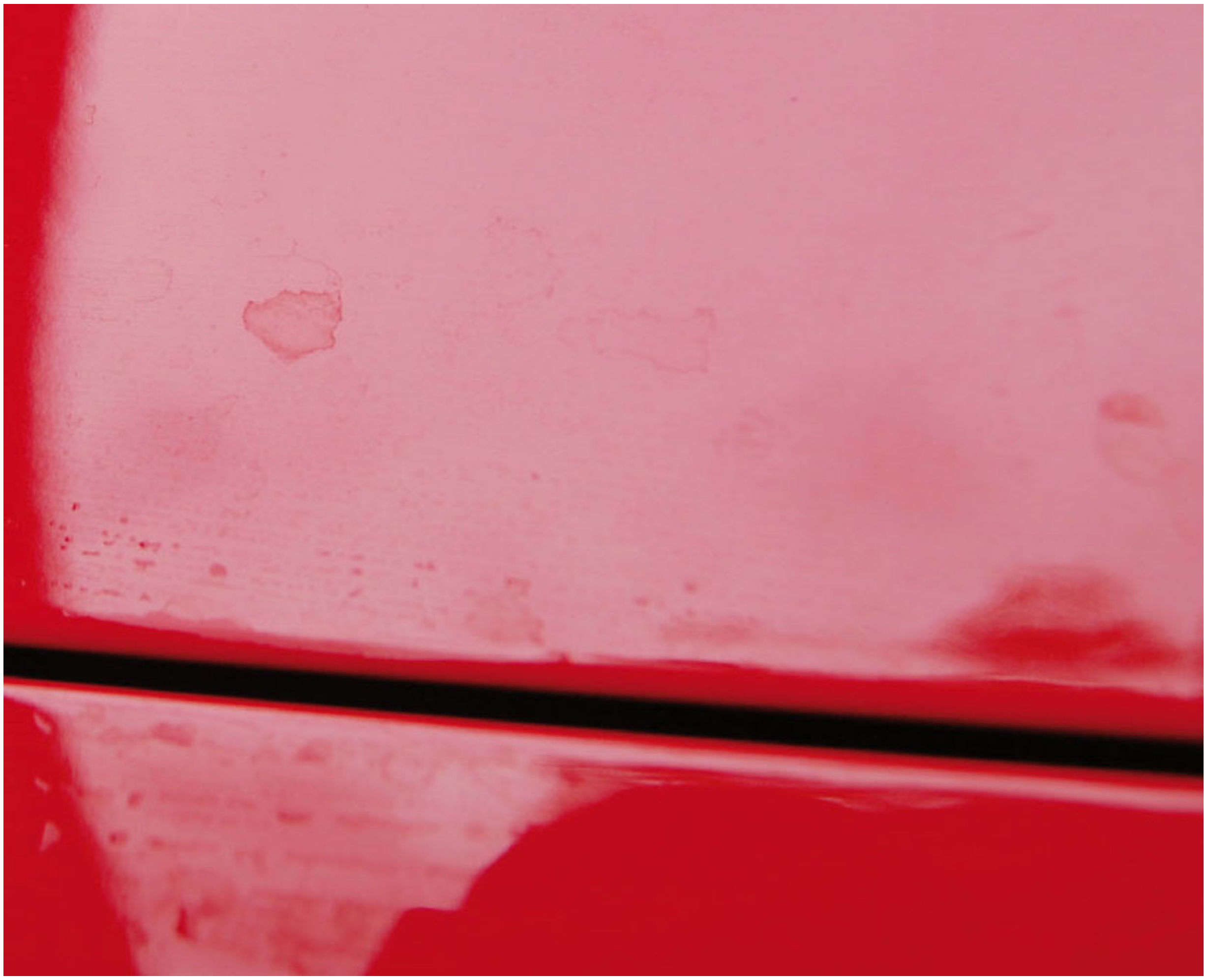
Frontal areas on vehicles suffer badly from insect debris, especially during the summer months. Besides being a sticky residue that can be very difficult to remove, insect debris can also be highly abrasive and even acidic. The best advice is to remove insect debris as swiftly as possible. Insect debris on glass will be slightly easier to remove and will have fewer potential side effects, so remove insect debris from paintwork first.

BIRD EXCREMENT

Bird mess is arguably the most aggressive and harmful contaminant encountered by car owners: it can etch deeply into paint within a matter of minutes or hours.

Bird excrement (or in less cumbersome terminology, ‘bird mess’) is a mixture of corrosive liquids and potentially abrasive solids – a particularly unwelcome combination as far as paint is concerned. There is an obvious danger of marring from the abrasive content, but the biggest issue is its corrosive nature. Bird mess can range from being highly acidic to highly caustic, depending on the bird's diet, and this could result in paint etching if it is left to dwell, especially on hot panels. Swift removal is therefore critical, especially because protection products rarely offer full protection against bird mess etching, but merely 'buy time' and decrease the severity of the damage; even nano-ceramic products may fail to protect paint from this most aggressive of contaminants.

WATER DEPOSITS

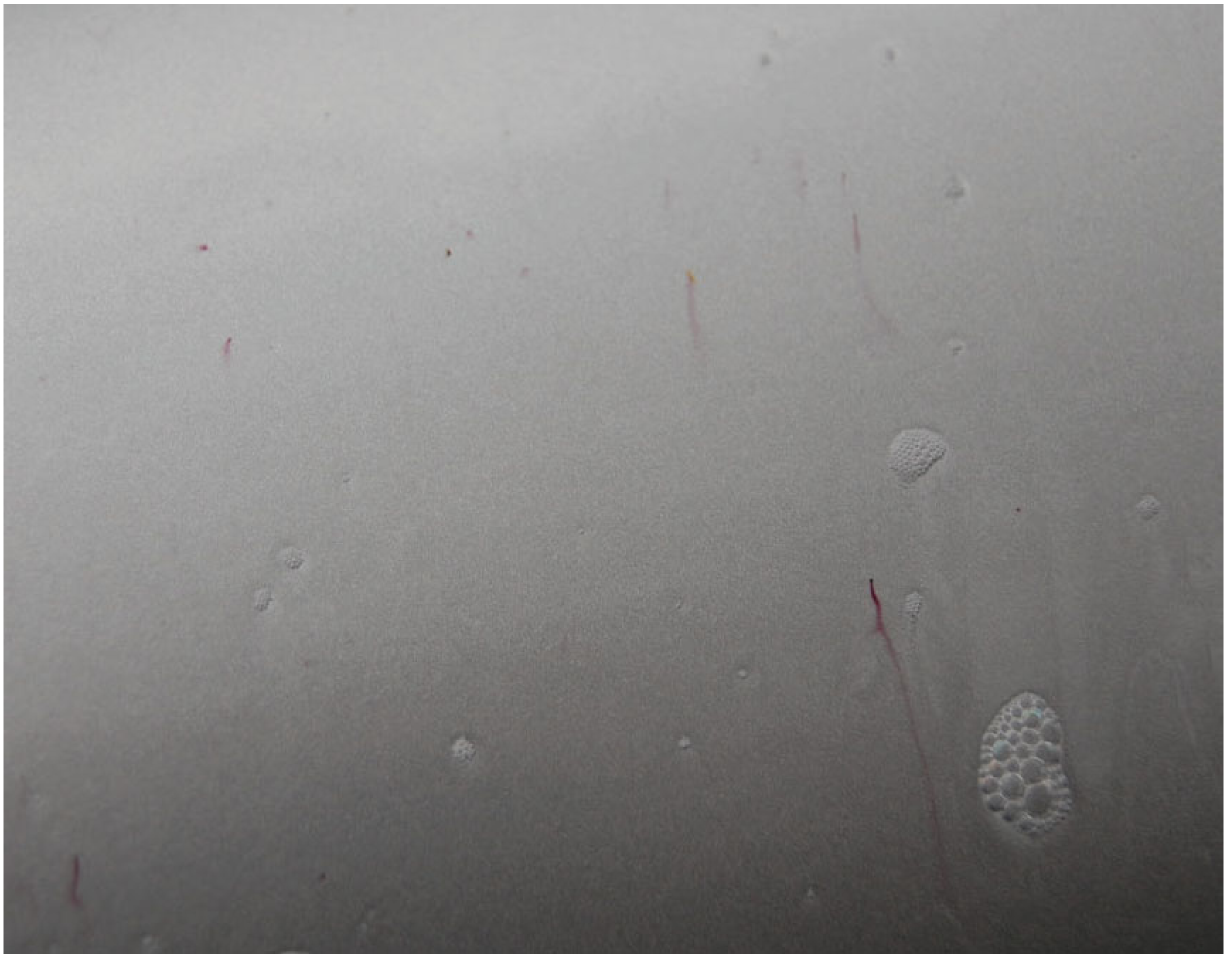


Water marks can be etched into the paint, or caused by contaminants sitting on top of the finish.

Water deposits may be referred to as ‘water marks’ or ‘water spots’, but this could cause confusion. Water marks are sometimes actually etched into the paint, caused by limescale’s mildly caustic action. These etched marks are a type of paint damage, and are not dirt or contamination. Water ‘deposits’, however, are surface contaminants carried by wash or rinse water, left behind on the paint when any standing water evaporates. These could be limescale deposits in hard water areas (if mains water has been used to wash or rinse the car), soap residue from the wash process, or just dirt that has pooled into water droplets (perhaps due to incomplete removal during the wash stage). Soap residue is of little concern unless it is heavily contaminated.

Dirt needs to be treated with caution because of its potential abrasiveness, but limescale presents the biggest issues. Not only is it mildly caustic, but it can also be extremely stubborn to remove from paint, especially if it has been left to stand. The simplest way to avoid water deposits is to rinse and then dry the car thoroughly. The use of deionized or filtered water for the final rinse can be an additional measure to guard against limescale deposits.

EMBEDDED METAL PARTICLES (FALLOUT)



Colour-change fallout removers make it easy to spot iron contamination, especially on white bodywork; iron deposits on wheels (from brake discs and pads) can also be removed easily with this type of product.

Fallout removers were, historically, extremely specialist products used (primarily) to remove metal contamination from railway-transported cars before sale. Now, they tend to be much more accessible, and subsequently, far more popular (it is worth noting at this stage that popularity does not diminish the potential misuse of these products: they are usually aggressive in action, capable of dissolving metal particles, and thus need to be treated with caution). The aim of these fallout removers is to eradicate embedded metal contamination stuck into the softer paint surface; previously, this contamination may have been caused by iron filings floating around in the air near railway yards and railway lines (track-cleaning machines create a large amount of airborne contamination, spewing iron filings into the immediate environment) or metal fallout from ironworks and steel foundries. These may land on painted panels and be inadvertently pushed into the softer paint surface during routine washing, polishing or waxing. Today, however, the main source of iron particles found on a vehicle's bodywork will be from brake discs and ferrous-metallic brake pads: every time cars brake they will create dusty, iron-rich deposits, and these will be circulated within the immediate area due to the vortices of a moving wheel. Most of this 'fallout' that lands on a car's bodywork will be washed away in the rain and fail to embed, but some of it will anchor. These embedded particles could be clayed from the surface (*see* the relevant section), but they may shear off in the process: treating the bodywork with a fallout remover could remove the metal 'tails' that remain.

Finally, note that using a fallout remover early in the detailing process is inefficient, and misleading as to the overall amount of embedded iron contamination present. Colour-change fallout removers will show signs of heavy iron contamination with general road dirt and grime. Washing the car will remove loose iron contamination and should always be carried out first, so the aggressive fallout remover only acts on the embedded particles.

TREE SAP, RESIN AND POLLEN

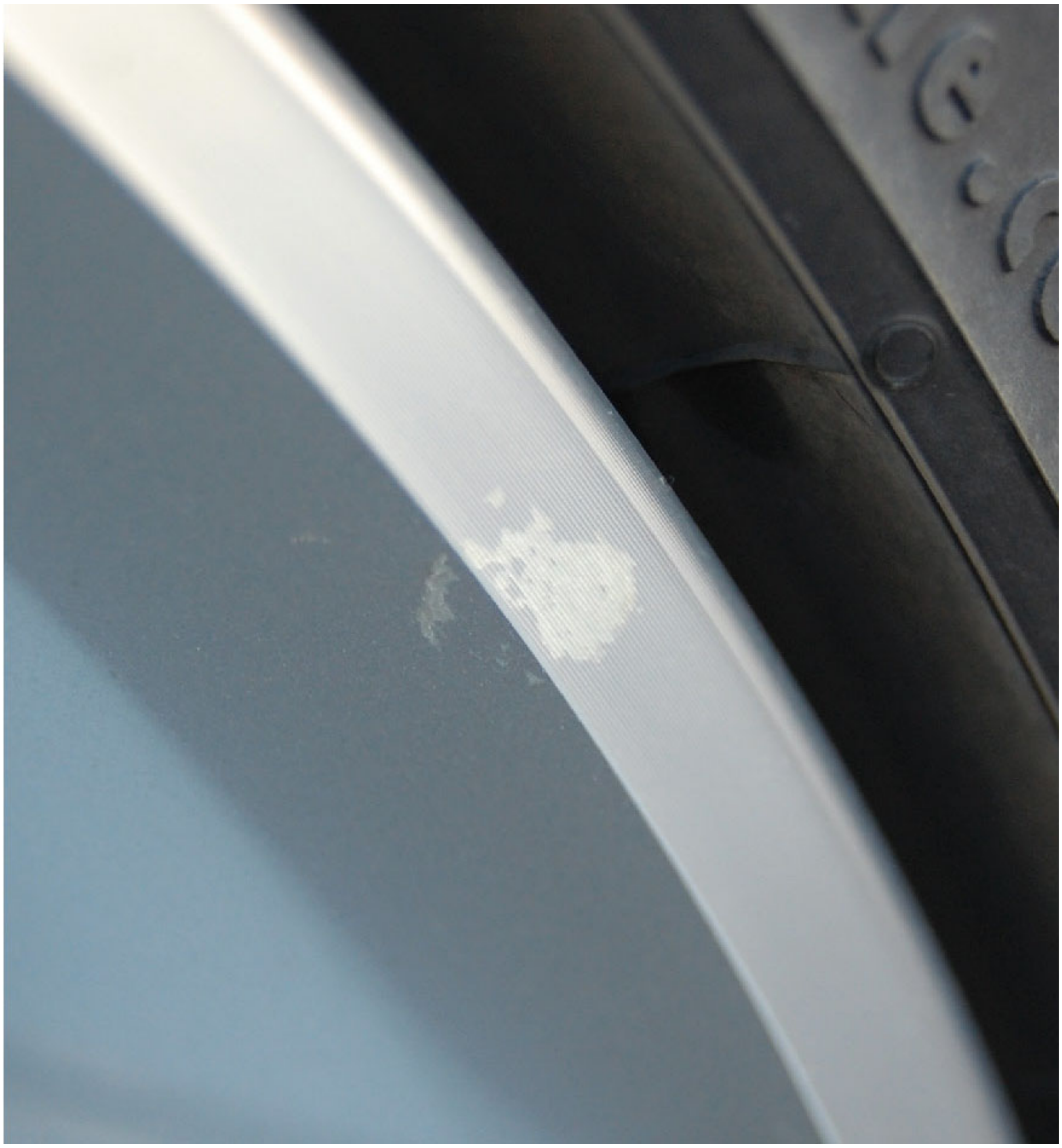
Tree sap is sticky and can be difficult to remove – just one reason to avoid parking underneath trees.

Tree resin takes the form of clear, hard flakes that weld themselves to the paint. These can be surprisingly stubborn to shift.

Tree sap and resin are sticky substances that have a notorious reputation in detailing circles for being stubborn to remove. Cars parked under trees are at high risk from this form of contamination. Whilst they are generally non-abrasive, the sheer effort involved in removing them may increase the chances of marring the paint unless the correct procedure is undertaken, and some tree sap may even be acidic in nature (and therefore likely to mar paint). Stronger cleaning products and clay bars are often employed; resin is a hard yellow deposit that tends to 'chip off' and can be removed with a clay bar, while sap is a clear, glossy liquid that takes the form of sugary spots on paint: these can usually be removed using an all-purpose cleaner or tar and glue remover.

Pollen from trees and plants can also be tricky to remove. Pollen particles have microscopic barbs that can help them anchor to paint, especially if it is older or oxidized. To make matters worse, it can be mildly acidic when mixed with water, as well as being an unsightly pale yellow ‘dust’ that can settle on paintwork at certain times of the year.

ADHESIVE RESIDUE



Adhesive residues can be removed easily with solvents, assuming they are of a standard nature. Isocyanate 'superglues' and epoxy adhesives will be harder to tackle, but these should not come into contact with exterior paint.

When vinyl stickers are removed, a patch of adhesive residue will invariably remain. Adhesive residue can also be found beneath wheel weights when wheels are rebalanced during the fitment of new tyres. These residues tend to be stubborn to remove without the use of strong solvents (such as tar removers) but are generally non-abrasive. If suitable solvents are used, there is rarely an issue with this type of contamination – although certain glues may cause permanent damage (such as superglue-style adhesives).

VOLCANIC ASH AND CEMENT DUST (CAUSTIC DUST)

Most dust that lands on a vehicle is far from benign. It may look relatively harmless, but any particle that is harder than the paint surface could potentially mar it, and some particles – such as volcanic ash or cement dust – are capable of mixing with raindrops to form a caustic soup that can etch paint. This kind of contamination often goes unnoticed until the removal of 'normal-looking' water marks is attempted, and etching is discovered. Effectively, each water droplet has become a small pool of caustic fluid thanks to its reaction with the volcanic ash or cement dust already on the surface of the paint. This water-mark etching is far more aggressive than that seen with regular water marks, where the limescale content may result in a mildly alkaline solution. Awareness of the issue and risks, the use of car covers when necessary, and regular washing all help to minimize the problem. Being downwind of a building project should be a cue to cover an exposed vehicle, for example.

Note that dried cement or concrete 'splats' (raised spots caused by the application of flicked wet cement) may need a specialist removal product if they have cured, and the paint will invariably be damaged and require polishing.

DRIED PAINT SPOTS

Paint spots can be profuse if someone has been spraying in the open air nearby; never attempt to polish them off the panel.

Dried paint spots are a problem when spray paints are used outside, and paint spotting of downwind vehicles can be profuse and highly inconvenient: it is rarely one or two spots in a confined area, but potentially dozens of spots spread across a wide area. The good news is that these paint spots have often substantially cured before ‘landing’ and therefore fail to adhere properly, especially if the paint surface they land on has been protected with a wax or sealant. Should the paint spot refuse to ‘dust’ off, it could be carefully picked off, removed by a clay bar, or in extreme cases sheared off with a tungsten carbide de-nibbing blade, or sanded off with a flat block and suitable sanding paper.

Regular polishes should *not* be used, however. These tend to remove the ‘good’ paint surrounding the spot at a similar rate to the defect being removed (the spot acts as protection for the paint immediately beneath it), and the result is damage to surrounding areas that would otherwise have been preventable.

As an aside, spray-paint vandal damage can often be dissolved with solvent, or machine-polished off bodywork, and larger paint spillages confined to the interior of a car (usually the boot) can often be successfully removed by scraping off the main residue and then re-wetting the affected area with water or solvent. Solvent-based paints are far more destructive, however, and may be impossible or uneconomical/unpleasant to completely remove (especially if they have dried) compared to simply replacing the carpet/affected area.

FINGER AND PALM PRINTS

Don’t touch paint directly. Use a folded microfiber cloth as a ‘buffer’, or wear latex/nitrile gloves.

Finger and palm prints are arguably the mildest type of contamination found on vehicles, but probably the most prevalent – and potentially the most annoying, if you own a show car. Whilst the light grease and oils that constitute finger and palm prints are easily removed, they are particularly unsightly and will often resist light rain showers. There is almost no chance of marring during removal, but it should be noted that dirty fingers or jewellery could mar paint when the prints are first made. As for the detailer themselves accidentally contaminating paint in this way, care should be taken only to touch paint with a microfibre cloth as a barrier – plus there is always the option of wearing soft cotton or nitrile/latex gloves. Note that greasy finger or palm prints consisting of sun-cream residue should be treated as 'grease or grime' and removed accordingly with all-purpose cleaner or a solvent.

ACID RAIN

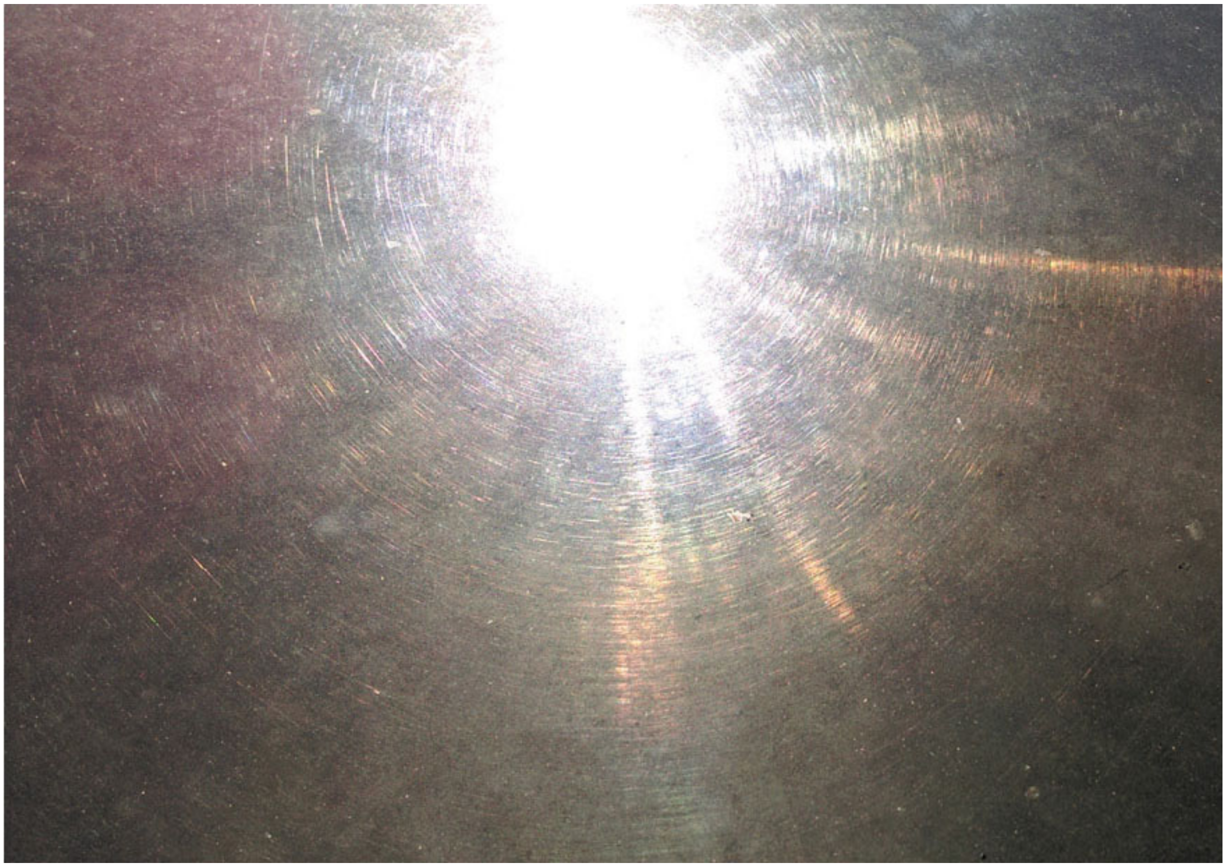
Although acid rain is mentioned here, it is not a specific contaminant that requires removal – it cannot be avoided when it rains and merely requires acknowledgement. A good wax or sealant should also be used to diminish or negate its potential effects. Acid rain is typically caused by sulphur emissions from coal-fuelled power stations, industrial pollution, and even the exhaust gases of jet engines. It illustrates that paint (and other surfaces of your car) are being attacked continuously from environmental factors, even without you realizing it; protecting those exterior surfaces must therefore be made a priority, rather than left to chance.

DEFECT/IMPERFECTION TYPES

Earlier in the book we tried to find a tangible and workable distinction between 'valeting' and 'detailing' and came up with a main point of difference: paint correction. Or at least, the amount of paint correction undertaken on a vehicle. This makes defect and imperfection removal arguably the most important part of the detailing process, as it is what actually *defines* detailing. It should be noted that detailing stops short of major restoration, and that whilst touching up small scratches or stone chips would come under the detailing ambit, respraying a whole panel (or car) would not. Apart from small instances of touching up painted surfaces, detailing generally only *removes* material, such as contamination or damaged paint. It doesn’t add to or replace the original surfaces found on a vehicle.

Defects range from critical paint damage from key scratches, to the mildest clay marring that may only be visible on darker coloured cars in certain light conditions. Imperfections refer to pre-existing paint problems, such as ‘orange peel’ and paint runs. These could be introduced during a respray or paint repair, or they could have been present on the vehicle from the moment it left the factory. Almost every defect and imperfection can be improved, but in some instances, full correction may not be possible. It depends on the defect or imperfection type and its severity.

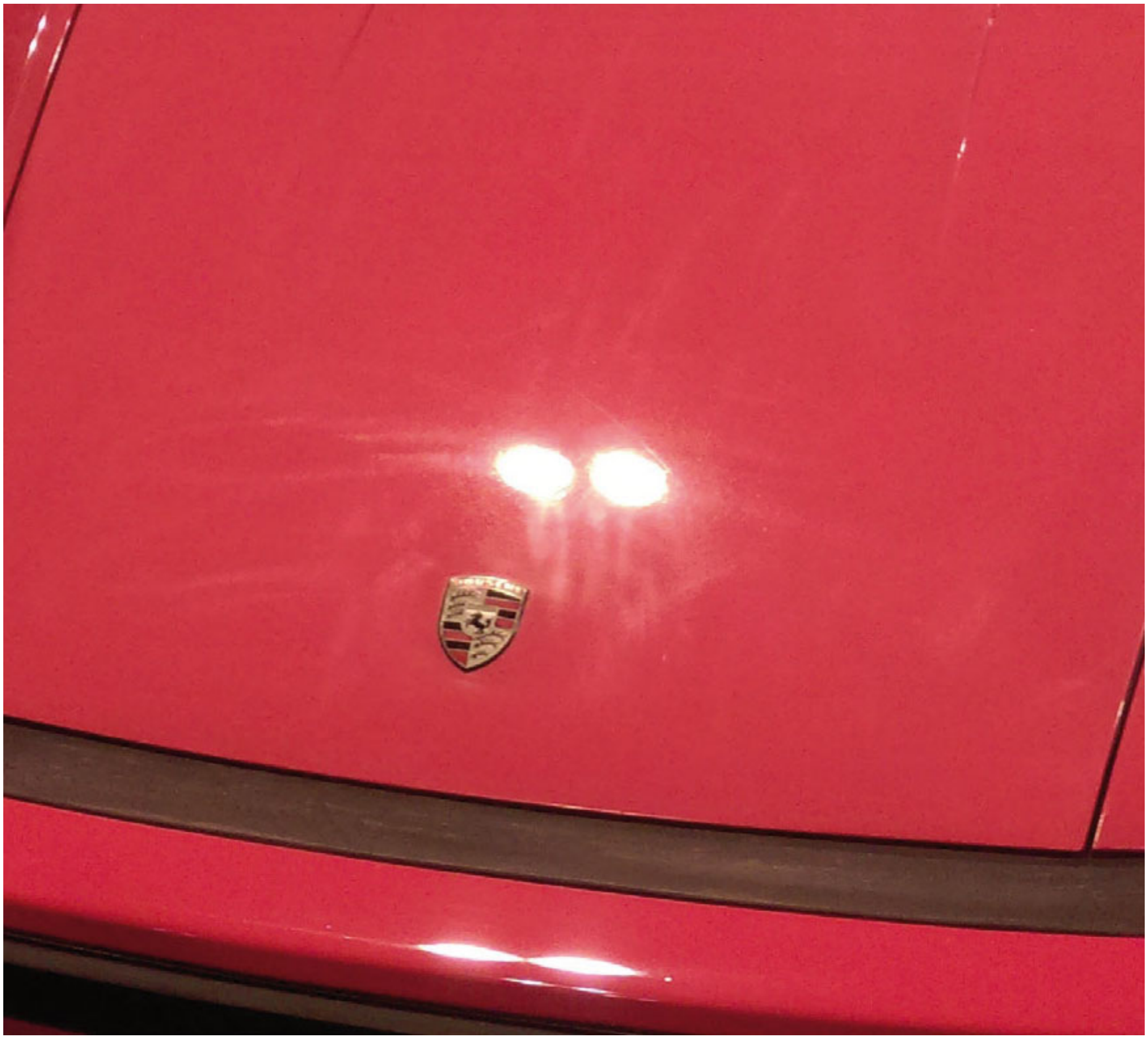
SWIRL MARKS (WASH MARKS)



Swirl marks are the most common type of paint damage, to the extent that many car owners see them as being ‘normal’. The effect is also referred to as ‘cobwebbing’.

The most common type of defect is the swirl mark, or rather, the swirl effect caused by thousands of interlinked wash marks. These are light defects, perhaps no more than a couple of microns in depth, but they tend to be introduced at every single ‘contact’ with the paint surface, especially if the person initiating that contact (usually at the wash stage) is not aware of the issue, or the ways in which swirl marks can be minimized. They are physically caused by grit or dirt of a greater hardness than the paint being rubbed or dragged across the surface. As most mud contains small particles of sand and other abrasive matter, and wash mitts or sponges have a pushing and sweeping action when used, it can be seen that swirl mark introduction is always going to be a danger at the wash stage. Note that using a mitt or sponge in straight lines does not eliminate the swirling, because if contamination and contact contrive to create marring, straight scratches will still *look* ‘swirly’ when a radial light source (like the sun) reflects off the surface.

MICRO-MARRING (INCLUDING MACHINE MARKS/HOLOGRAMS)

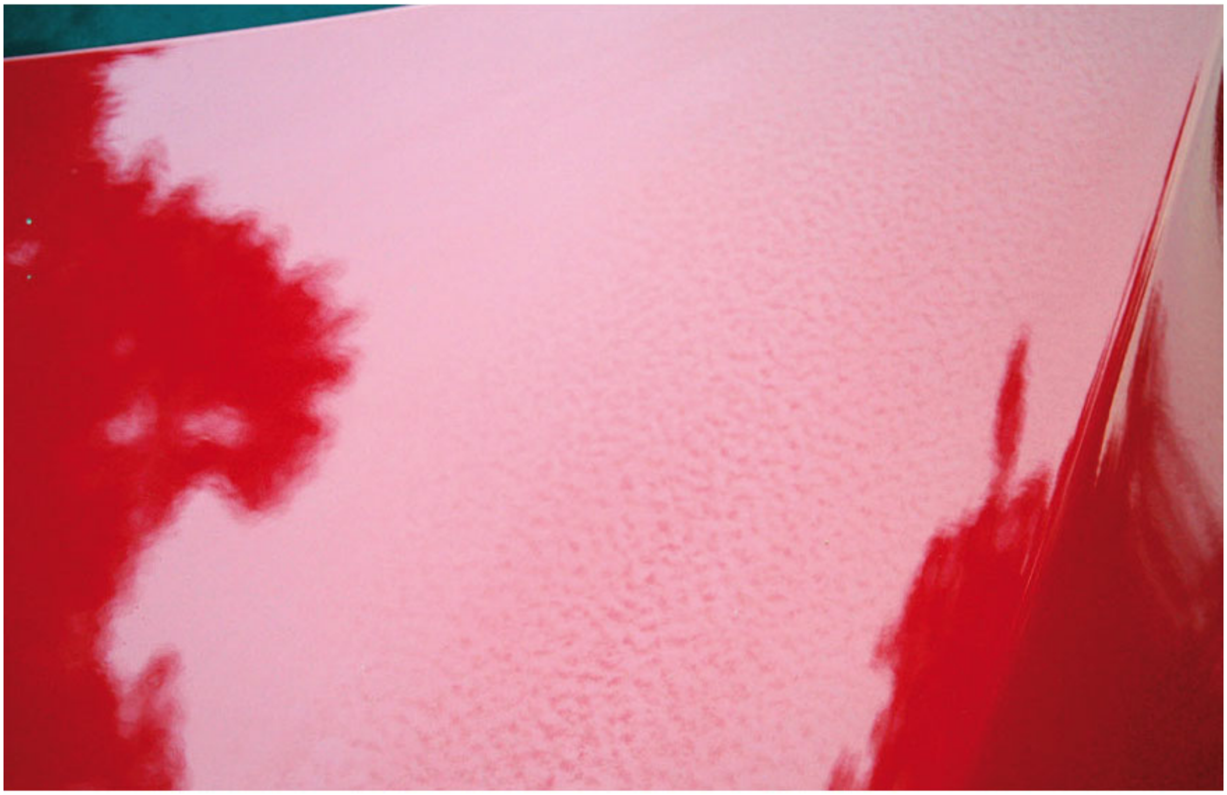


Holograms are a type of micro-marring, caused by insufficient refinement during the machine-polishing process.

Lighter scratching than common swirl marks is classed as ‘micro-marring’ and will generally be caused by mildly abrasive materials rather than contaminants. Applicators and cloths that are used aggressively or have a coarse texture (relative to the hardness of the paint) could gently scuff the paint surface and cause these marks, dulling the shine and inhibiting reflections. They will typically be no more than one or two microns in depth, and easily machine or hand polish out of paintwork.

Micro-marring can also be caused by the action of machine polishing; abrasive compounds and aggressive pads may cut paint deeply and quickly, but often leave a less refined finish behind. These ‘machine marks’ are small scratches of a similar depth and type to traditional micro-marring, but they will invariably be in a radial pattern caused by the circular motion of a rotary machine polisher. These radial patterns, when combined with micro-marring, create a hologram effect on dark paints in the sun. Therefore, this machine-created micro-marring is commonly referred to as ‘hologramming’. Often this hologramming only becomes visible after ‘drop back’, when glaze oils (used in certain machine polishes, glazes and detailing sprays) evaporate after a week or two; these oils readily fill the micro-marring, giving the appearance of a perfect finish during initial inspection, only to desert the panel later.

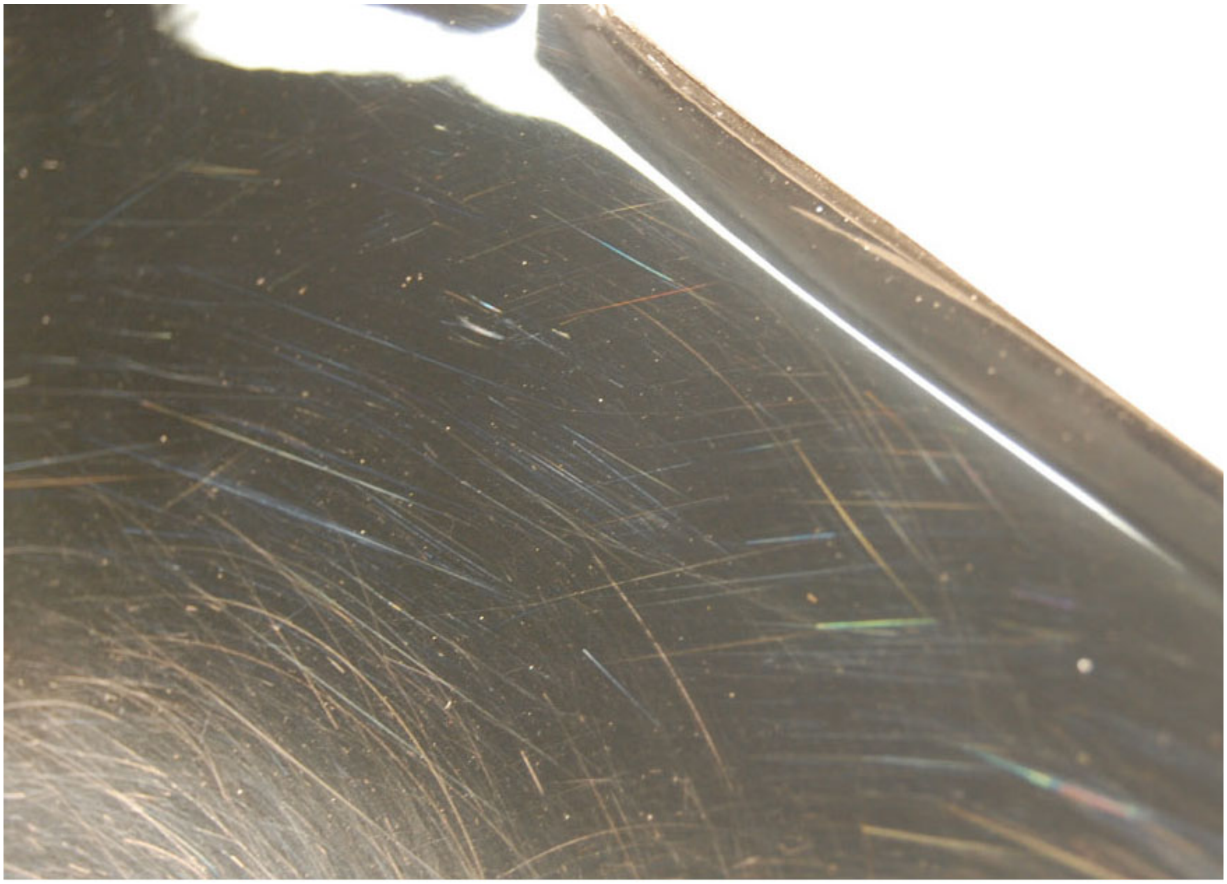
CLAY MARRING



Clay marring has a mottled appearance, and whilst it looks serious, it is extremely light damage that can be corrected easily with mild machine polishing.

Whilst fine-grade clays rarely trouble modern clearcoat finishes, aggressive ‘coarse’-grade clays could cause marring. Softer paints will also be susceptible to this mild form of paint damage. It takes the form of a very mild scuffing, showing up as a dull or mottled finish. This is typically less than a micron in depth and easily removed by hand or machine polishing, but will be unsightly (and a potential worry to the uninformed clay-bar user who may fear that they have caused extensive damage to the paint).

RANDOM DEEP(ER) SCRATCHES (RDS) OR RANDOM ISOLATED DEEPER SCRATCHES (RIDS)



RDS, or RIDS, are random deeper scratches. These are more significant than the light marring/swirl marks caused by a poor wash regime, and they can be much harder to remove.

Scratches in the paint that are deeper than usual, perhaps inflicted by tree branches or an extremely poor wash regime, will be three or four microns deep at least (and could be as deep as ten to twenty microns). Whilst normal swirl marks cannot be felt by carefully running a fingernail over them, RDS and deeper scratches may make themselves known. As the name suggests, they are differentiated from common swirl marks by their depth and random formation.

RDS are not necessarily the deepest scratches seen on paint (such as key scratches, which usually require new paint application), but they can be stubborn to remove and require extensive polishing or sanding. In most cases it would be wise to leave the deeper RDS, rather than attempting to remove them fully; rounding them off will improve their appearance and make them less noticeable, anyway.

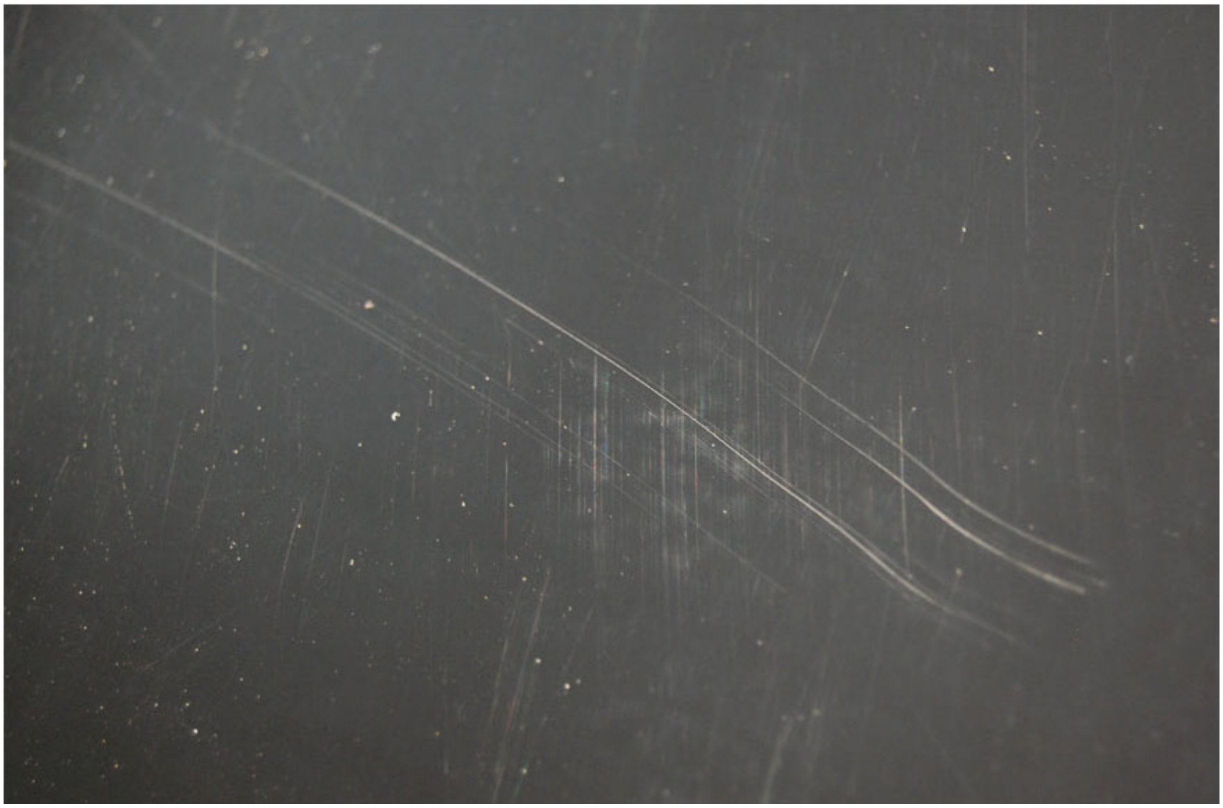
Cars tend to pick up RDS with usage and age. An old car may be covered with them, but a newer example may have very few defects of this type.

DETAILING TERMINOLOGY: WHERE DOES IT COME FROM?

The acronym ‘RIDS’, for ‘random isolated deeper scratches’, is a great example of detailing terminology – an almost indecipherable code for a very specific detailing ailment that all detailers and valeters will recognize (either in acronym terms or in ailment terms), but which will mystify members of the general public. Online forums and groups have been a great way for detailers to share ideas and theories and to develop a common detailing ‘language’, but credit for this term – and many others, such as ‘LSP’ for ‘last step product’ – lies with a legendary US detailer called Mike Phillips. Mike has worked tirelessly for many years to develop detailing theories and common-sense concepts that valeters and detailers can adopt to great effect.

Defining defects, creating useful terminology, and shooting instructional videos has marked him out as the ‘father’ of modern detailing. His thoughts and philosophies are as much a part of his work as developing paint correction techniques or testing new products and equipment. You do not even have to agree with Mike Phillips to appreciate the significance of his considered and cerebral approach to detailing matters; we personally prefer the concept of ‘protection product’ for a wax or sealant, rather than ‘LSP’, because ‘protection product’ describes the type of product better and also acknowledges that it may not necessarily be the final step of the detailing process – but LSP acted to group waxes and sealants together, which was far more useful in detailing terms than trying to analyse their differences.

ULTRA-DEEP SCRATCHES (UDS) AND SCUFFS

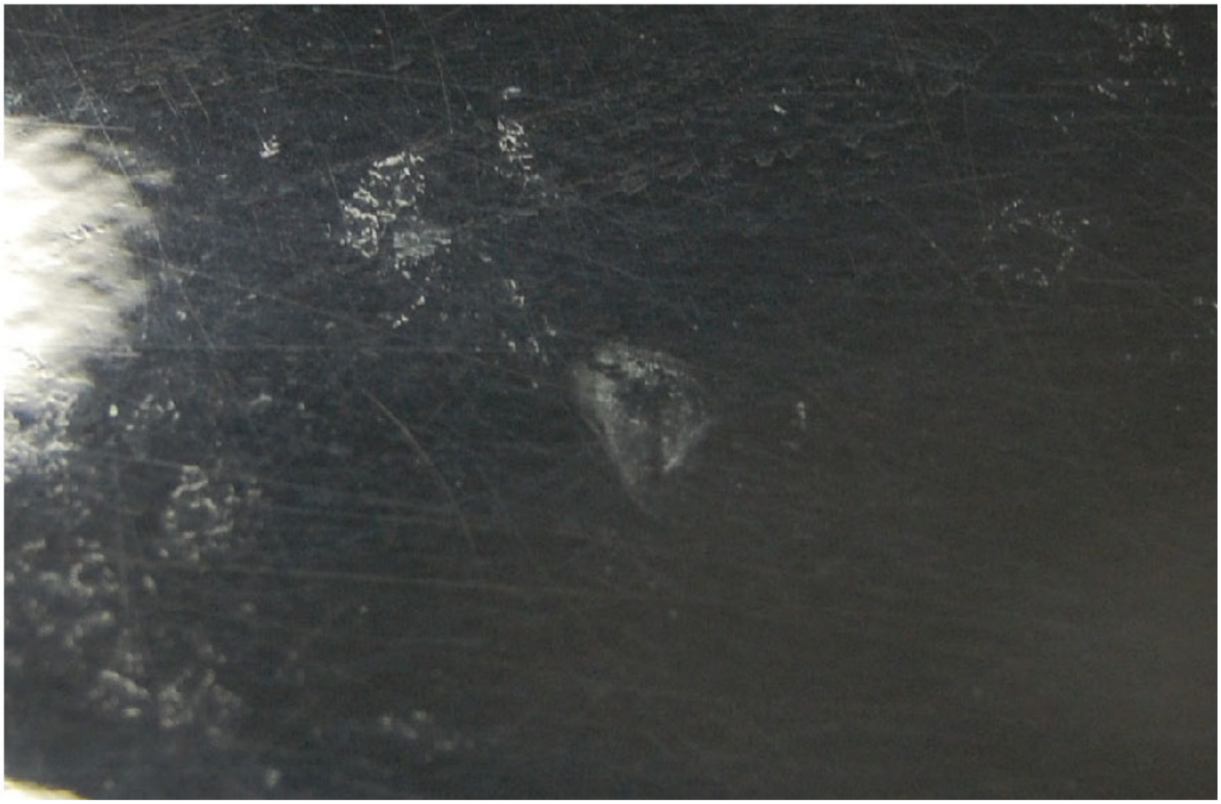


UDS are ultra-deep scratches, perhaps with a white, scuffed appearance where the clearcoat has been torn. It may not be possible to remove them completely without jeopardizing the surrounding paintwork, but they can usually be significantly improved.

Beyond the RDS is the UDS – the ultra-deep scratch (a cluster of them could be referred to as a ‘scuff’). This is an extremely significant and deep scratch, perhaps caused by vandal key damage or a collision. UDS will be felt with a fingernail, may show clearcoat chipping, and could appear white (or a pale shade) in colour. This will either be because they have breached both the clearcoat and colour coat paint layers, revealing the primer coat (unlikely), or (more likely) it will simply be an optical effect due to the serious scuffing. If the whiteness polishes out, then the UDS is likely to have been contained within that paint layer, but it may be difficult to tell without expert inspection or physical experimentation on the paint surface itself.

Many UDS will have to be left in the paint, or touched in. Polishing them may make them less noticeable by removing scuffing and rounding the edges of the scratch, but if they remain after intensive polishing (perhaps including wet sanding) then paint correction should be aborted: it simply isn't worth removing tens of microns of paint from surrounding areas, and risking the overall finish. It is normally a better course of action to get the scratch touched in (and then polished until it is nearly invisible), or to get the panel resprayed/SMART repaired.

ETCHING (WATER MARK ETCHING, BIRD MESS ETCHING)

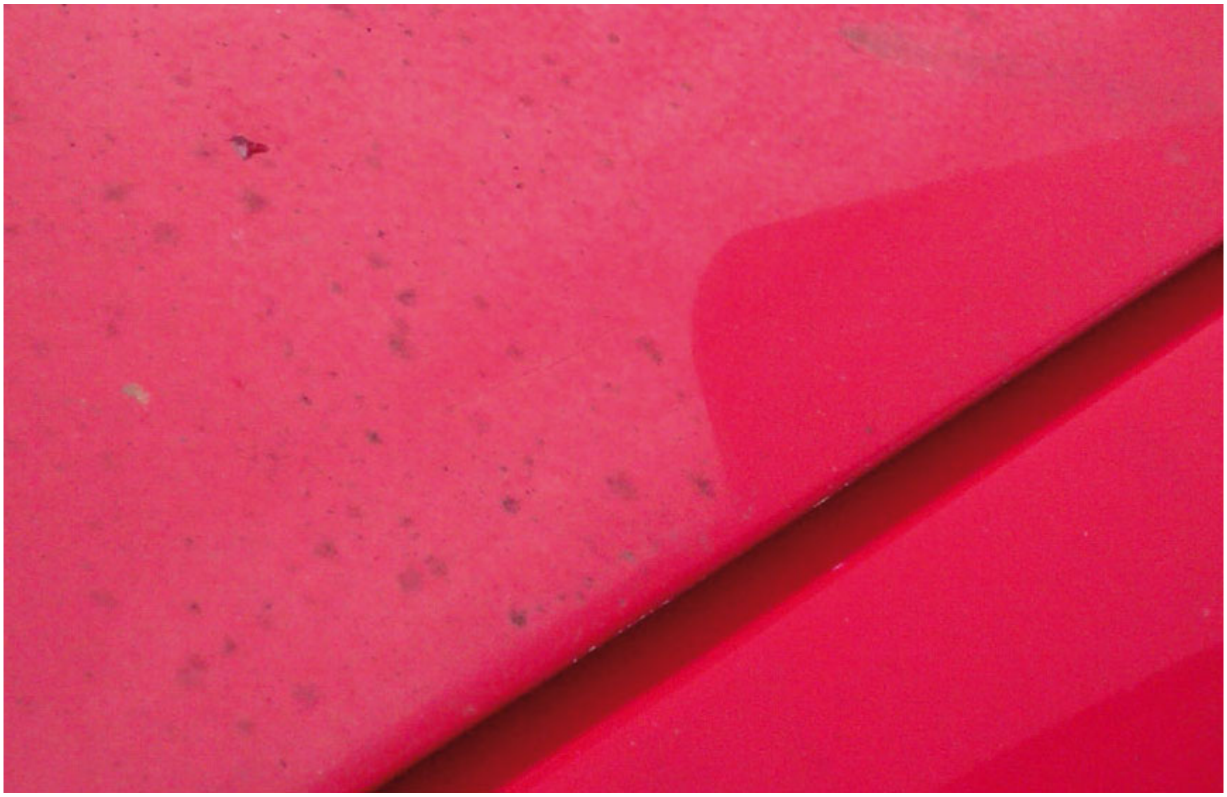


Etching is a deep cratering of the paint surface. Bird mess is the most common cause.

Etching is deep cratering to the paint surface caused by some kind of corrosive action. It is usually the result of bird mess, water spots with a high limescale content, or water spots that have been contaminated by cement dust or volcanic ash. Some softer paints will be more susceptible to this damage, but never underestimate the potential dangers as harder paints can be etched if the contaminants and conditions dictate.

Sanding is usually the most effective way to remove etching, because the damage could be between four and ten microns deep, and perhaps more (etching can sometimes be felt when tested with a fingernail). Extensive machine polishing may also be effective, but could be more time-consuming than sanding.

PAINT FADE

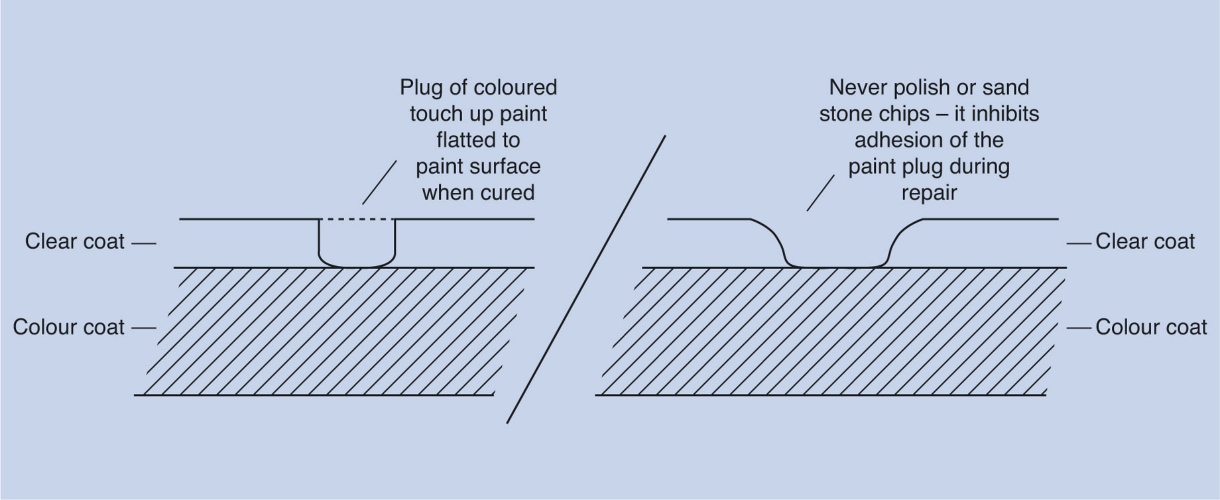


'Pink' reds are a sure sign that the finish has oxidized (faded) due to the action of UV rays in sunlight.

Paint fade typically affects older single-stage paints, particularly reds and blacks. It occurs when UV light degrades the paint surface, causing microscopic cracks and fissures to compromise gloss and reflectivity. Theoretically, if the paint is cut back enough, the damaged surface will be completely removed and a perfect paint finish will be revealed underneath. Unfortunately, if the paint fade is substantial and the paint is old, the damage could be four to ten microns deep (and frequently more). This would mean substantial sanding or polishing with no guarantee of a perfect end result. In these circumstances, a respray could be more time and cost effective.

Note that paint fade may also affect clearcoats, turning them cloudy and dull, and is often referred to as 'paint oxidation'. Oxidation historically refers to old paint types having metal-derived pigments that could degrade over time; modern clearcoats are more chemically inert but they still contain molecular bonds that can be attacked by the elements, most notably UV radiation from the sun; this breaks down the paint finish in a similar way.

STONE CHIPS


Plug of coloured touch up paint flatted to paint surface when cured
Never polish or sand stone chips – it inhibits adhesion of the paint plug during repair
Clear coat
Colour coat
Clear coat
Colour coat

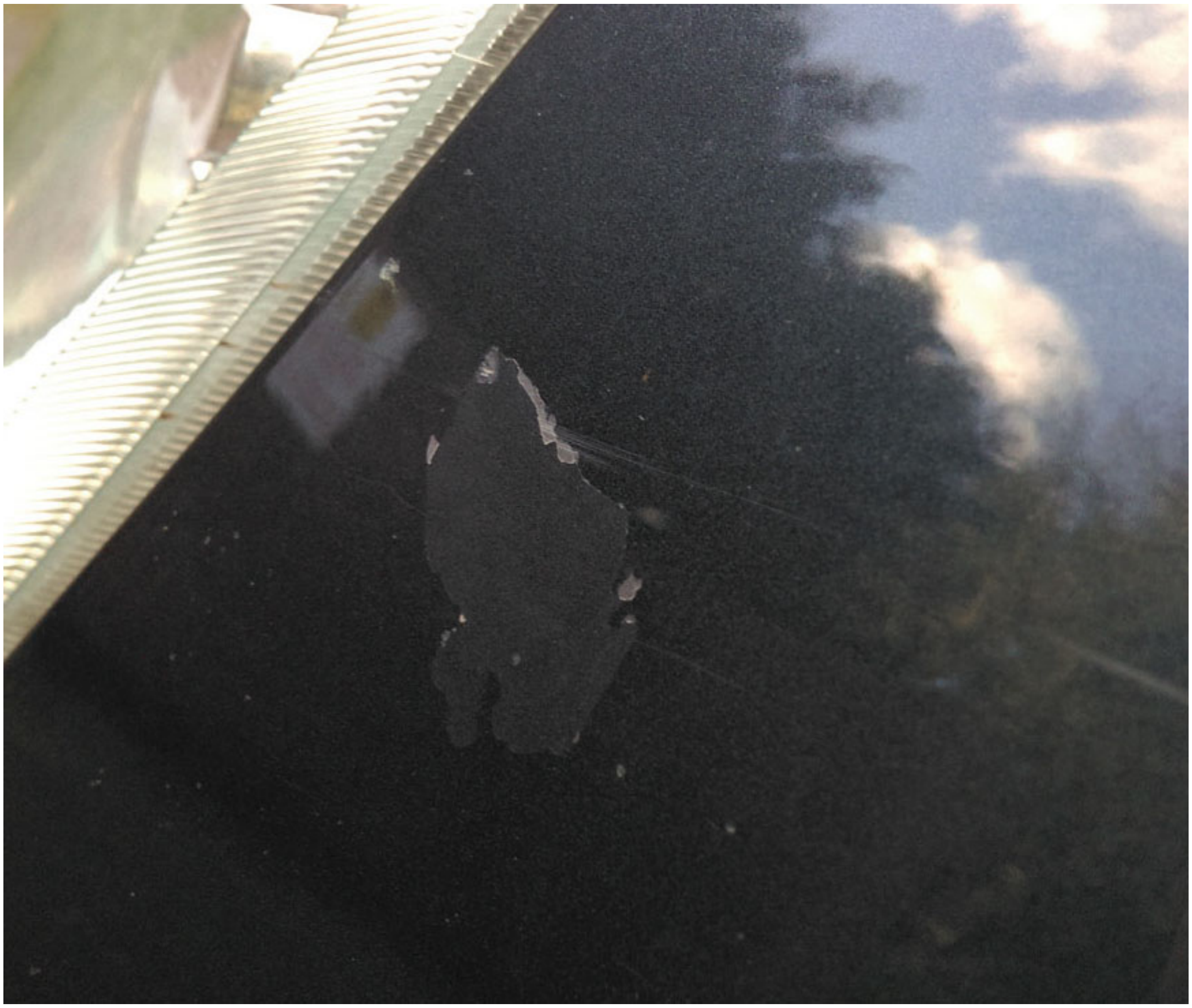
Stone chips.

The harder a paint or clearcoat, the better it resists scratches, but the more likely it is to chip or fracture if hit by a stone. Conversely, softer paints and clearcoats mar easily but present a more flexible front to incoming stones, and therefore resist chipping.

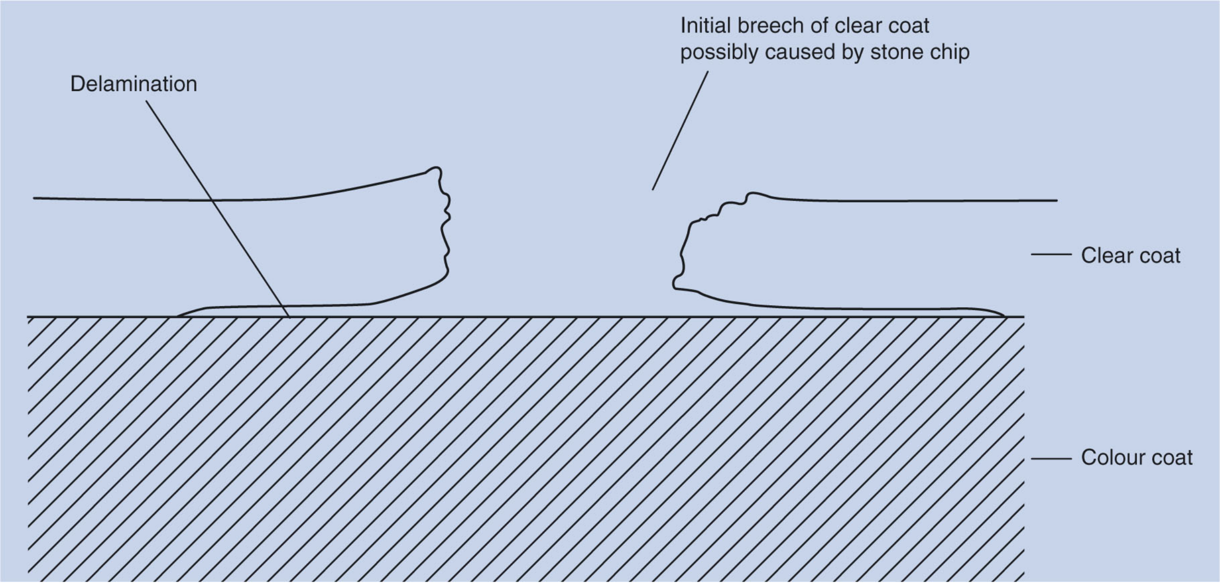
Stone chips need touching in with a suitable paint. They shouldn't be polished due to the touch-up paint requiring a sharp (rather than rounded) crater edge, for adhesion. If there are more than a dozen paint chips on a panel, it may be far more efficient and sensible to get the panel resprayed. Even a carefully filled chip could be visible upon close inspection, and a good result cannot be achieved quickly and without some effort.

Also, prevention is always going to be better than cure. Some show cars have frontal areas smothered in masking tape on the way to an event (time-consuming, plus there is a small chance that adhesive residue may need to be removed afterwards), but paint protection film could be a good, and semipermanent, option.

LACQUER PEEL (FLAKING CLEARCOAT)



If clearcoat starts to flake, be careful not to aggravate the issue by using products or techniques that lift the edge of the lacquer further.



Flaking clearcoat.

Poorly resprayed, old or damaged clearcoat is susceptible to flaking. This means it peels away from the colour base coat, and if left unattended, the damage will get worse and worse as the peeling migrates. Use of a pressure washer, strong cleaning solutions and washing-up liquid (which has a high salt content) can all exacerbate the problem and should therefore be avoided if flaking clearcoat is spotted.

Clearcoat tends to flake from paint edges or from areas of pre-existing damage (caused by stone chips or rust, for example), so spotting and fixing lacquer peel before it becomes a more major problem is advised. In the event of major peel, sanding the clearcoat's peeling edge and re-clearcoating the panel may be the best course of action.

MISCELLANEOUS PAINT DAMAGE, DENTS

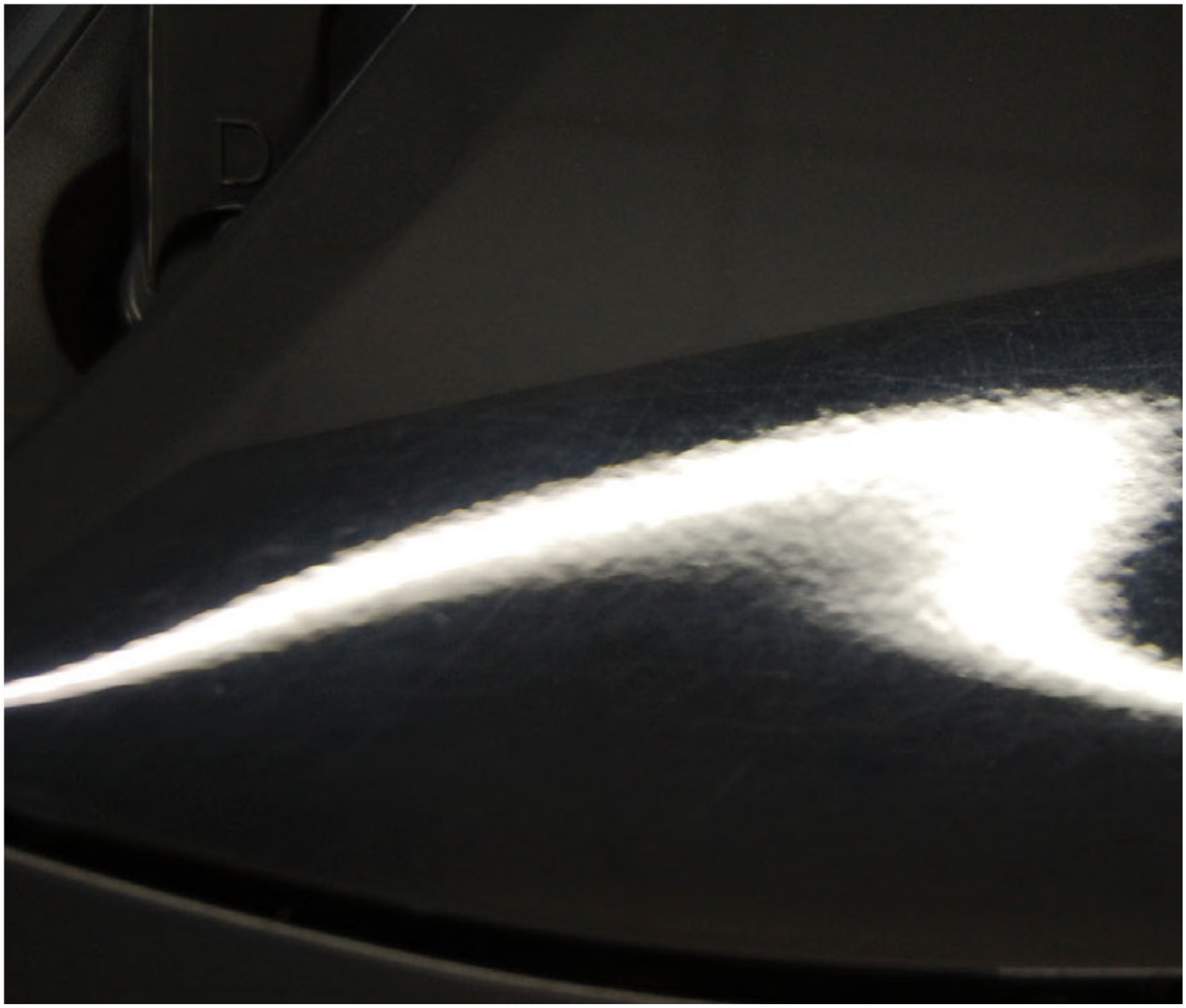
Cars are used in a wide variety of situations and their paint is subjected to many different environmental conditions, contaminants and cleaning chemicals. There will always be the potential for damage or some kind of defect that is not covered (or even anticipated) in a manual. Therefore if a defect is spotted that has not been categorized here, assess it for severity and try to establish what has caused it and how it could be rectified (if at all). For example, an egg thrown by a vandal at a car will cause deep radial impact damage in the paint (due to the hard shell exploding against the paint surface). It will be difficult to polish out, but could be sanded, touched in, or the panel could be repainted.

Dents are outside the detailing remit and should be repaired by a PDR (paintless dent repair) specialist or bodyshop unless the correct techniques are known. After the dent has been repaired, some residual paint damage may remain, so paint correction or repainting may be necessary.

PAINT IMPERFECTIONS

Sprayed paint can play host to a plethora of imperfections. These should have been removed after painting by the sprayer, but are frequently left in accidentally or due to low professional standards. The common paint imperfections are listed here:

Paint runs: These can be sanded out if in the uppermost paint layer. A poor paint mix or spray technique is usually to blame.



'Orange peel' is a paint defect so common that it is now considered to be quite normal. Original paint finishes typically exhibit mild orange peel, especially on vertical panels.

Orange peel: This describes a mottled, rippled or pock-marked imperfection in the paint finish. It can usually be sanded out because it is most often in the upper clearcoat layer, but removal is arduous as it can affect large areas of paint at a time. It tends to be caused by poor paint levelling due to the mixture/curing process, or by the paint layer being sprayed too thickly.

Fisheyes: If paint-repellent products such as glaze oils or waxes are not removed from the surface prior to painting (usually a strong 'panelwipe' needs to be extensively used), then 'fisheyes' can result – small dimples where the paint has puckered around the repellent spot. These dimples are extremely deep and cannot be easily polished or sanded, but there is a chance that they could be touched in (although the nature of the fisheye makes paint adhesion less likely to be successful).

Dust nibs: Small dust particles or other items of debris that land on curing paint will stick into it. These should be polished or sanded off by the paintshop (a process called ‘de-nibbing’), but if they remain, then this procedure may fall to the detailer.

Lifting lacquer/separation: When clearcoat fails to bond to an underlying paint layer, it can lift. This normally presents itself in the form of a milky patch of paint that retains some gloss on the upper surface. It can’t be corrected, but needs to be removed, and then the section or panel can be repainted.

Overspray: Paint overspray is likely to affect trim or peripheral areas of bodywork more than regular panels, because it is often a side effect of inadequate masking. The small dried paint spots that result will be more stubborn to remove than standard airborne paint spots because they will have cured more effectively. A coarse-grade clay is usually required to remove them. Failing that, they could be removed (from paint) by a de-nibbing blade or by sanding with a block.

CONTAMINATION REMOVAL

A hand ‘contact’ wash, where a mitt or sponge makes physical contact with the paint, is the minimum level of car care undertaken by a car owner, and because budgets and agendas vary widely, there is no such thing as a standard wash: a large number of products, processes and techniques exist. In order to establish a clear and robust wash procedure, we must therefore break down the humble hand car wash into its two basic forms and make a distinction between a ‘maintenance’ wash and a ‘decontamination’ wash. Thus a maintenance wash is a light wash intended to remove surface dirt only, and leave ‘useful’ residues such as protection products (waxes, sealants and so on) as unaffected as possible. A decontamination wash, on the other hand, is far more purposeful, undertaken to remove as many contaminants as possible from the paint surface – and it is assumed that ‘useful’ residues will be removed as a side effect of this process.

The equipment, products and processes for each may differ. However, one constant remains: any form of contact wash could potentially inflict marring. The chances of damage to the paint will generally *increase* with the amount of dirt/contamination, and generally *decrease* with the amount of lubrication present during the removal process. Water is a plentiful and common lubricant, and helps remove dirt in almost any application – and if it is not employed, a suitable ‘waterless’ or ‘dry wash’ product (preferably high in lubrication) could be used instead. Therefore, always use plenty of wash media during the main part of the wash, and also increase the safety of the overall process by introducing a pre-wash stage. A simple guideline is ‘never attempt to contact wash a contaminated, *dry* surface’. Even if plenty of car shampoo is used, the risk of marring will be higher than if you had wet it first via a pre-wash.

Of course, you could go ‘contactless’, and this is covered in both the maintenance and the decontamination sections. But although the prospect of abrasive contact damage is reduced, contactless techniques are only truly effective in limited circumstances. The contact wash cannot be avoided and should be investigated and mastered, knowing that any defects introduced at the wash stage can potentially be removed later in the detailing process, through surface rectification techniques.

For Scratch-Free Cleaning
GRIT GUARD
For Scratch-Free Cleaning
GRIT GUARD
Don't Wash Anything Without It

The contact wash is the mainstay of a car-care regime. A sympathetic contact wash will always make use of two buckets.

Note that you should always carry out pre-washes and washes in the shade or in cooler temperatures; water is an important lubricant in both standard and rinseless washes, and waterless products will be more difficult to use if they dry out prematurely.

TOP DOWN THEORY

Whether for maintenance or decontamination, a contact or contactless wash should always be carried out from the 'top, down' (or rather, 'top, moving downwards'), unless using snow foam. There are two simple reasons for this: gravity and contamination intensity.

Gravity: A liquid applied to the surface will be at the mercy of gravity and will fall to its lowest point. By applying wash media or cleaning products to the highest point of the vehicle, you will be ensuring that they make contact with as much contamination as possible on their way downwards. Efficient use of these products will not only make them work more effectively and speed up the wash process, but there could also be a long-term cost saving (because less product is used), and positive environmental implications. A secondary benefit is that all the dirt removed by the cleaning process is carried away to the lower sections (for removal later) rather than contaminating parts of the vehicle that have already been cleaned.

Contamination intensity: The bottom half of a driven vehicle tends to pick up the majority of contaminants, as brake dust and other debris spin up from the wheels to its sides and rear; there is also more general splash-back from puddles and rain, and it is inevitable that larger amounts of dirt will be kicked up and end up sticking to the lower surfaces of the vehicle as it moves along the road. And just as the lower half of a vehicle tends to collect more contamination, so it receives less natural cleansing during subsequent rainfall. Nevertheless, whilst rain is quite a poor cleaning agent, and can actually kick up dirt on lower panels, it may still help to remove dust and loose contamination from the upper areas.

What all of this means, of course, is that the top of the car is usually cleaner. The car should therefore be washed from the top downwards for reasons of wash hygiene – and this is especially important with a contact wash, where increased dirt means a commensurate increase in the potential incidence of marring.

The exception is the use of ‘snow foam’, which is applied from the bottom of the car, upwards. But this is only so that the product can dwell for longer on the lower sections – and remember that this is also a contactless process. When initial snow-foam coverage has been completed, the traditional top down theory kicks back in, with slip (and contamination removal) occurring in a downwards direction, as usual.

WASH ORDER

Firstly, it needs to be decided whether heavily soiled areas such as the engine bay, underside and wheels are tackled first, before the bodywork. These are covered specifically in later chapters, but the reason to bring them up here is a simple one: if they are detailed later there is a good chance that the bodywork will be re-contaminated.

There is no 'right' or 'wrong', here. It is down to personal preference. With care, heavily soiled secondary areas can be cleaned successfully *after* the bodywork, without risk to their surroundings. Note that this level of care comes at a cost: tackling the dirtier areas last will be more time-consuming and potentially more difficult – although it will help keep wash water clean until the later stages of a detail, if using a solitary wash bucket. If the heavily soiled areas are tackled first, the only potential disadvantage is prior contamination of wash equipment. Wash water, mitts and brushes will obviously become dirty very quickly and will need to be thoroughly cleaned before they are used on the bodywork (or other areas of the car). The best solution could be to tackle these areas *after* the pre-wash, but *before* the main contact wash. This prevents wash equipment becoming too dirty, and also allows for any accidental re-contamination of panels to be addressed later.

Once the decision has been made regarding prioritization of heavily soiled areas, the wash order for the bodywork stage can be formulated:

1. First, clean all door shuts, bonnet and boot shuts (these will be moderately soiled, so may not need a pre-wash but will certainly need to be contact washed); then proceed with a 'top down' wash regime.
2. Next wash the roof surface. . .

3. . . .then the glass, including any surrounding bodywork including wing mirrors and trim.
4. Then tackle the remaining horizontal surfaces, such as the bonnet and boot panels.
5. Next, wash the top half of the off-side (the driver's side of the car, which generally stays cleaner than the near-side). Many vehicles have a natural mid-point or swage line, separating the sides into upper and lower portions, making this easier (if your vehicle doesn't have this visual clue, then simply estimate the upper and lower sections).
6. Then go round the car from the front, cleaning the upper half of the front end (including headlights and grille), following round via the top half of the near-side (passenger side), and then to the upper half of the rear.
7. Finally, wash the lower sections, working around the car methodically from the off-side through to the rear. This may include the areas just under the sills and just inside the wheel arches (although note that the underside is treated as a separate section for the purposes of this book, due to its much higher levels of contamination). Change over to an old sponge or mitt, if available, and rinse it thoroughly and frequently. This will be the dirtiest part of the wash.

PRODUCTS

Contamination removal products range from the gentlest shampoos to highly aggressive acids and alkalis used to eliminate metal fallout and other contaminants embedded in the paint. Due to the wide variety of products available, the different kinds of contaminants present and the numerous processes involved in contamination removal, it is important to familiarize yourself with the main product types.

Maintenance Shampoos and Light 'Washes' (including Snow Foams)

Snow foams are extremely popular, but they are weaker cleaning products in practice, due to high aeration.

These are ‘gentle cleansers’ designed to leave beneficial coatings (such as waxes or sealants) intact whilst removing general road dirt and grime. Typically they contain a blend of surfactants (soaps) and are pH neutral. In theory they can be used many times over before they significantly diminish beneficial coatings, but a lot depends on the product’s ingredients and dilution ratio. Grease (contaminant) and wax (beneficial coating) are difficult for surfactants to differentiate: too strong a mixture will invariably attack the beneficial coatings as well as removing contaminants more effectively. Snow-foam variants of these maintenance products will often be even weaker in effect, due to the high aeration of the mixture. They rely on a substantial dwell time to redress this balance.

Heavy Duty Shampoos and Traffic Film Removers (including Snow Foams)

TFRs (and TFR snow foams) are more aggressive, having a stronger chemical cleaning effect.

If more cleaning power is required, a stronger shampoo (or stronger shampoo concentration) could be chosen. A dedicated traffic film remover (TFR) might also be employed; these are generally caustic products with a far more aggressive cleaning action than pH-neutral maintenance shampoos. Snow-foam variants make far more sense here, given the more aggressive nature of the raw ingredients. Even a short dwell time may yield good results.

Note that TFRs can be destructive to sensitive finishes and should only be used when necessary. Heavy duty shampoos are also likely to remove beneficial coatings previously applied to the paint.

Waterless and Rinseless Wash Products

Waterless and rinseless wash products dispense with the need for a separate rinse stage, for reasons of convenience or ecology.

Hosepipe bans, ecological concerns regarding water consumption and mass-market preference for ‘single-stage’ cleaning products of convenience, have all contributed to a rise in the number of waterless and ‘low water’ rinseless products available. Waterless products attempt to dispense with water entirely at the pre-wash or wash stage, by providing a cleaning solution (usually via a spray) that is applied directly to a dirty surface.

Rinseless products use water for dilution, so aren't completely waterless. . . although 'waterless' products are likely to be pre-mixed with a small amount of water as well. They are usually mixed in a bucket and then 'sponged' on to the paintwork (or 'mitted' on, as is more likely with modern detailing techniques). In both cases, gloss and lubrication (to try and prevent marring from dirt particles present, due to the inevitable lack of a thorough pre-wash) will often be supplied by some form of oil content (possibly a type of silicone oil).

THE BIG NO? HAND CAR WASH CENTRES, AUTOMATIC CAR WASHES AND DIY CAR WASHES

Automatic car washes are rarely used by detailers, who consider them too harsh – but in reality they may inflict less damage than an inexpert contact wash.

This chapter covers washing by hand in all its minutiae, so it is unlikely that the reader has any particular interest in employing others to do the work, let alone a fully automatic machine. But a question may remain, namely what makes these alternatives so unattractive to the detailing community?

The hand car wash has a simple flaw, which is the economic model of washing vehicles as effectively, as quickly and as cheaply as possible. This means that the techniques, processes and products employed could be less than ideal, and a potential danger to pristine paintwork. It is also unlikely that every staff member touching the car will be fully trained and aware of high-end wash protocol. For many, though, hand car washes offer a cost-effective and convenient route to getting their car clean, so we should not deride the services they offer. We should just be aware that keeping paint in pristine condition is not their main intention and would rarely be achieved during a wash.

Automatic car washes, especially the more modern varieties, also offer a convenient and cost-effective solution to car cleaning, but most still use a contact system of rotating brushes and rollers, and even the new softer brushes (made of foam or cloth) can mark paint if they contain dirt deposits or are simply too harsh for softer paint finishes. Whilst contactless automatic washes exist, a contactless wash of any type may only be truly effective in instances of very light soiling, and this still applies here. The nature of automatic systems also means that the chemicals and processes used tend to be quite generic and far from the best type available. On the ‘plus’ side, automatic car washes often recycle their water effectively (an ecological benefit), and use filtered water for the final rinse, so they may surprise detailing enthusiasts brave enough to try them. But they are, and are always likely to be, the ‘fast food’ option of the car-cleaning world. For those with more sophisticated tastes, multi-stage ‘gourmet’ detailing will always have more appeal and yield safer, better results.

DIY car washes – hand car wash bays where you wash the car yourself, using equipment and products supplied by the operator – have none of the labour-saving qualities of hand car washes or automated car washes, nor do they have the quality of equipment a private detailer might enjoy. Indeed, the cleaning solutions are typically delivered by a hollow brush that resides on the ground before meeting some unsuspecting body panels: an absolute guarantee of swirl marks. Whilst the sophistication and selection of car-care products offered by the more advanced systems partially redeems this approach, the longevity and overall effectiveness of these spray-on products tends to be limited. Better results will be obtained using more specialist equipment and products, applied with care and without the pressing timeframe of a coin-operated countdown.

Degreasers, Solvents, APCs and Tar Removers

Grease, tar, rubber and old product residue may resist removal by weak soap solutions, and will only be removed effectively by solvents – the main ingredient of ‘degreasing’ products. Tar removers tend to be neat solvents of a high strength or concentration, whereas APCs (all-purpose cleaners) will blend surfactants (soaps and detergents) with solvents to create a more versatile cleaning mixture. APCs tend to be dilutable with water so that the strength of the product can be altered, depending on the application.

Bug Removers

These are dedicated products to remove insect debris on glass and paintwork. The ingredients will range from the usual solvents and surfactants to acids, alkalis and even live enzymes designed to break down biological matter. Note that some form of lubrication would be attractive in a bug remover, to help prevent the bug carcass marring soft paint.

Clay Bars, Decontamination Blocks/Sponges/Mitts/Cloths (and Lubricant)

Clay mitts are as common as clay bars these days, and both have a single aim: to remove embedded contamination.

‘Clay’ is the name given to a decontamination bar made from polishing media and elastomeric polymers. It is a kneadable, sticky block that abrades, shears and sucks contaminants from the surface of paint. Due to the fact that it is made from abrasive polishing media, it is used ‘wet’ (after rinsing during the wash stage, but before drying) and usually with a clay lubricant.

Decontamination blocks and sponges are clay substitutes, using rubberized paint surfaces or abrasive foam to act in a similar way to traditional clay bars (the rubberized paint may also be applied to mitts, cloths and machine polishing pads to increase versatility). Both types of decontamination media tend to work best with some form of lubrication. Clay lubricant will either be surfactant based (effectively a strong soap solution) or silicone based (hence the use of quick detailing sprays in the role) to provide slip. Note that whilst some clay bars may contain mild enough abrasives to forego the use of additional lubricants (beyond water), the contaminants picked up by the clay bar may be of a larger particle size or harder in consistency than the clay materials themselves. This means that the use of a clay lubricant could still be advisable to prevent marring to the paint surface during the claying process, even if the clay bar is advertised as being of a type that solely requires water for lubrication.

Detailing Sprays and Drying Aids

Quick detailing sprays are some of the most heavily used detailing products, perfect for light cleaning and gloss enhancement on protected paint surfaces.

Detailing sprays are general-purpose detailing products, capable of adding gloss (and even protection, in some cases) as well as cleaning dirty paint surfaces. They have a high water content (water being a plentiful and useful solvent), oils to add gloss and lubrication, the possible addition of waxes or sealants for gloss and protection, and frequently small amounts of surfactants or solvents to increase specific cleaning applications. Whilst unlikely to be the most effective cleaner in a detailer's arsenal, the detailing spray is cheap, plentiful, versatile and convenient, and therefore frequently used in a cleaning capacity. Drying aids are concentrated quick detailers used to lubricate any dirt that remains on the paint surface during the drying stage, and the drying towel itself. They may also increase water sheeting/removal from the panel and residual gloss.

Polishes

Abrasive polishes are effective cleaners due to their scouring action, but they may mar soft paints. They are also unsuitable for heavily soiled panels, where the contaminants may become mixed up with the polishing media and cause damage to the paint when the polish is worked.

EQUIPMENT

Paint cleaning and decontamination equipment ranges from the mundane (the ubiquitous bucket and sponge) to the sophisticated and industrial (steam cleaners, hot pressure washers, de-ionized water filtration systems). Their use will depend on suitability, accessibility and (of course) budget.

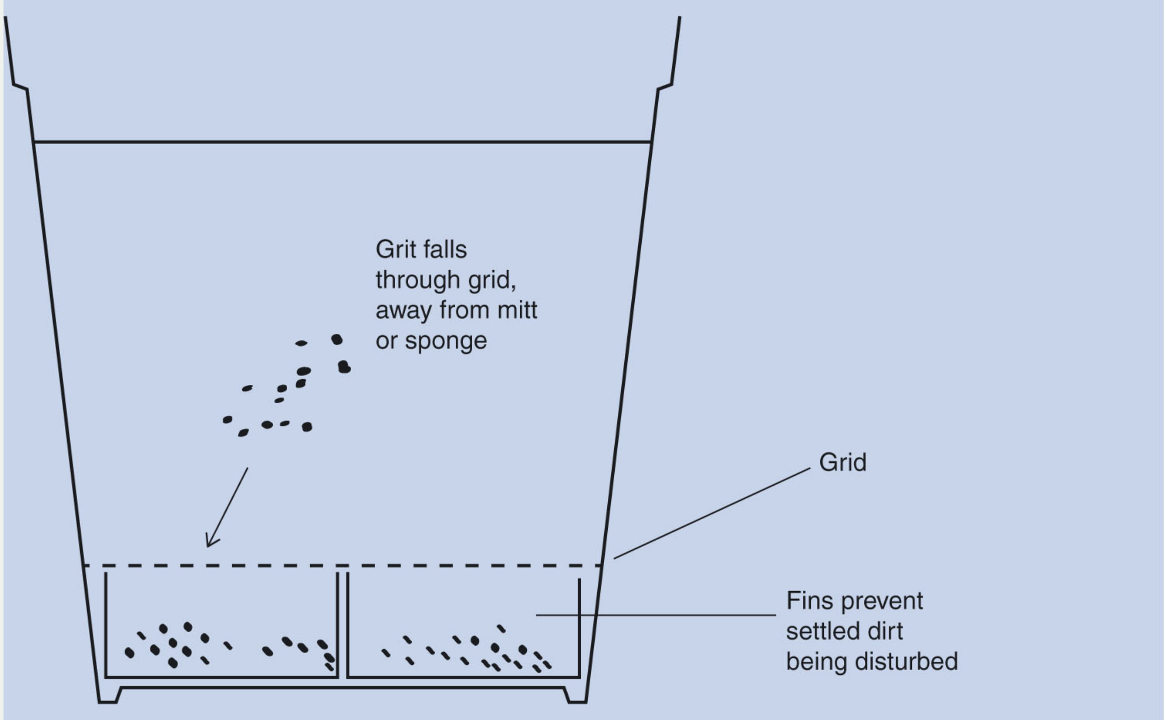
Wash Buckets and Accessories (including Grit Guards/Scratch Shields)

Wash buckets need no introduction, although it should be noted that multiple buckets are better employed (wash and rinse, at the minimum). Bucket capacities simply need to be large enough for convenience and application; washing large cars with small buckets will prove frustrating, especially if the car is heavily soiled (rinse water should be changed if it gets too dirty); 9–10 litre buckets tend to suit small and medium sized cars, whereas 12–20 litre buckets suit larger vehicles or professional applications. In terms of accessories, bucket 'dollies' can be purchased (making buckets easier to move when full of water and also minimizing the chance of stone damage to their bases) and there are sticker kits, bucket organizers and 'gamma seal' watertight seals available. But the most famous accessory of all is the 'Grit Guard' bucket filter (a similar product is available in the UK called the 'Scratch Shield', which tends to fit smaller buckets more successfully).

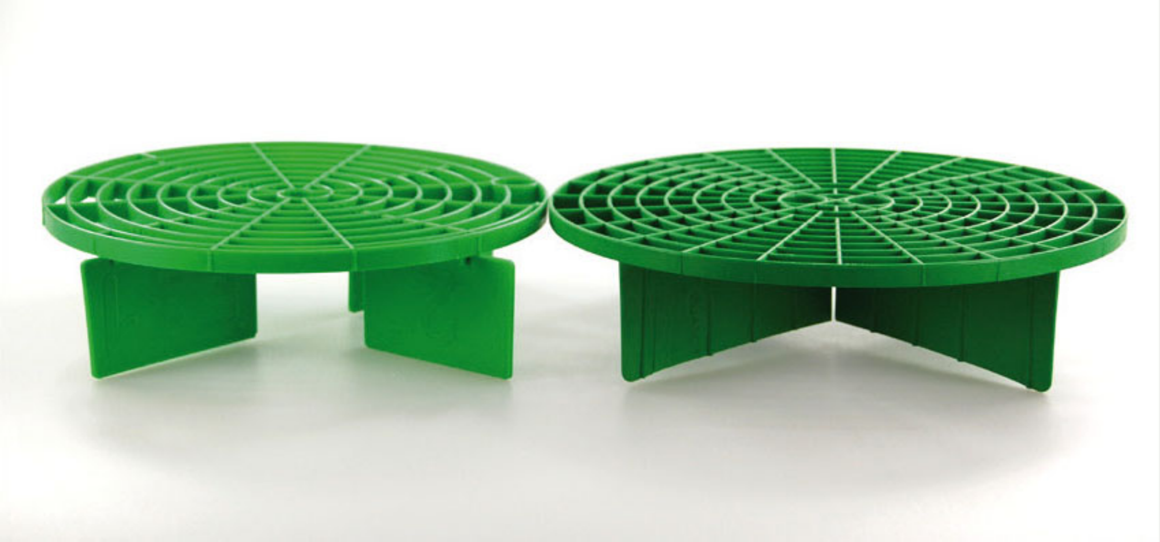
The Grit Guard is a finned plastic grate that sits inside the bucket, at the bottom. Its aim is to minimize the transfer of dirt from contaminated bucket water on to sponges or mitts, first by keeping the dirt at the bottom of the bucket, by allowing it to sink below the grate, away from where it can be picked up by the mitt or sponge; second, by preventing excessive turbulence when a mitt or sponge is plunged into the bucket (which would otherwise help contaminants disperse throughout the water) by means of the finned blades the Grit Guard sits on; and third, by presenting a rough 'grate' surface for mitts and sponges to be cleaned against. Together, these all contribute to mitt/sponge hygiene and keep the wash or rinse water above the Grit Guard as clear and uncontaminated as possible. Some detailers may even use two Grit Guards, one on top of the other, for greater wash safety, although this does reduce the working capacity of the bucket by denying the detailer a few more inches of 'clean' wash water.

Finally, note that buckets generally come in three different types of plastic: opaque, natural and crystal clear. The opaque plastic buckets are 'solid' plastics and not transparent. Natural plastic is a milky white colour and is semi-transparent. Crystal-clear plastic buckets are fully transparent and have the advantage of showing how dirty the water has become – but note that this material is typically more brittle than natural and opaque plastics. Crystal-clear buckets should only be used with dollies or placed on lids or other clean/smooth surfaces (especially when full of water). Crystal-clear buckets placed on uneven ground when full of water will have a propensity to crack.

BUCKET FILTERS IN ACTION



Bucket filter.

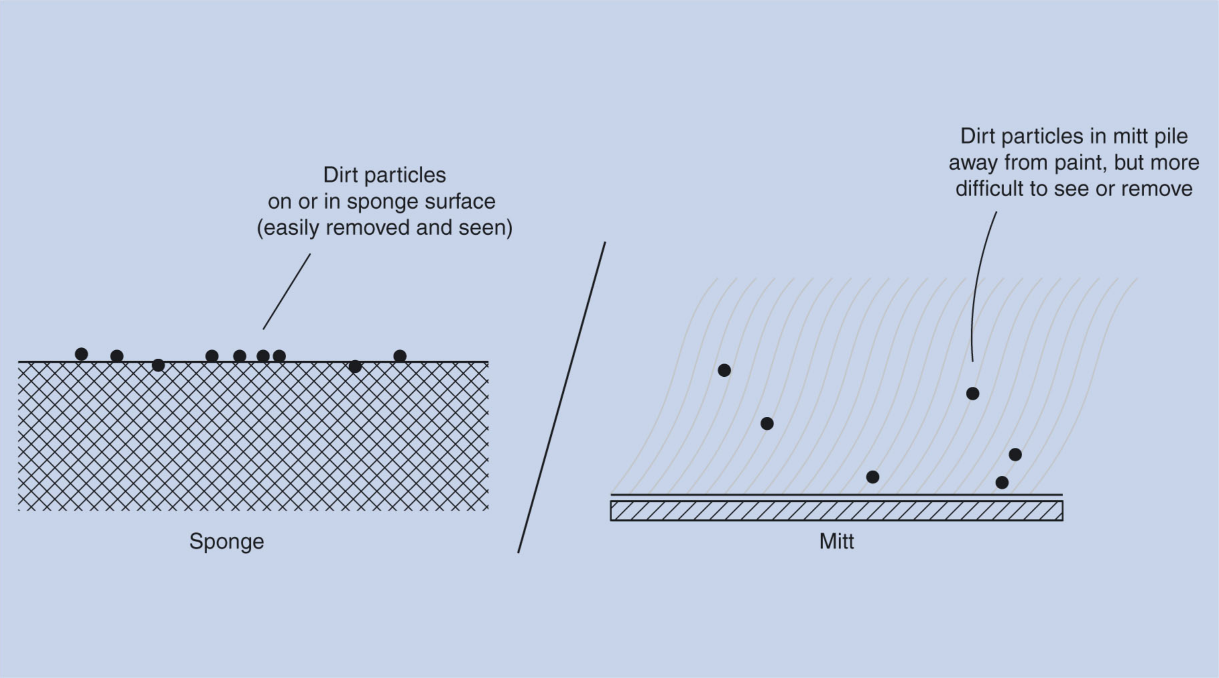


Scratch Shield versus Grit Guard. The Scratch Shield is smaller and less robust, but has adjustable fins, allowing it to fit a wider range of buckets.

A bucket filter (Grit Guard, Scratch Shield) is a plastic grate, suspended on lateral fins, that sits in the lower section of a bucket. Its benefits are as follows:

- Dirt falls through the grate and collects at the bottom, well away from a mitt or sponge
- Water disturbance does not agitate or recirculate the dirt as much as it would do normally, due to the fins reducing any ‘vortex’ effects
- The grate can be used to ‘groom’ a mitt or sponge; scraping a mitt or sponge against the grate may help remove dirt from its surface

Wash Sponges and Mitts

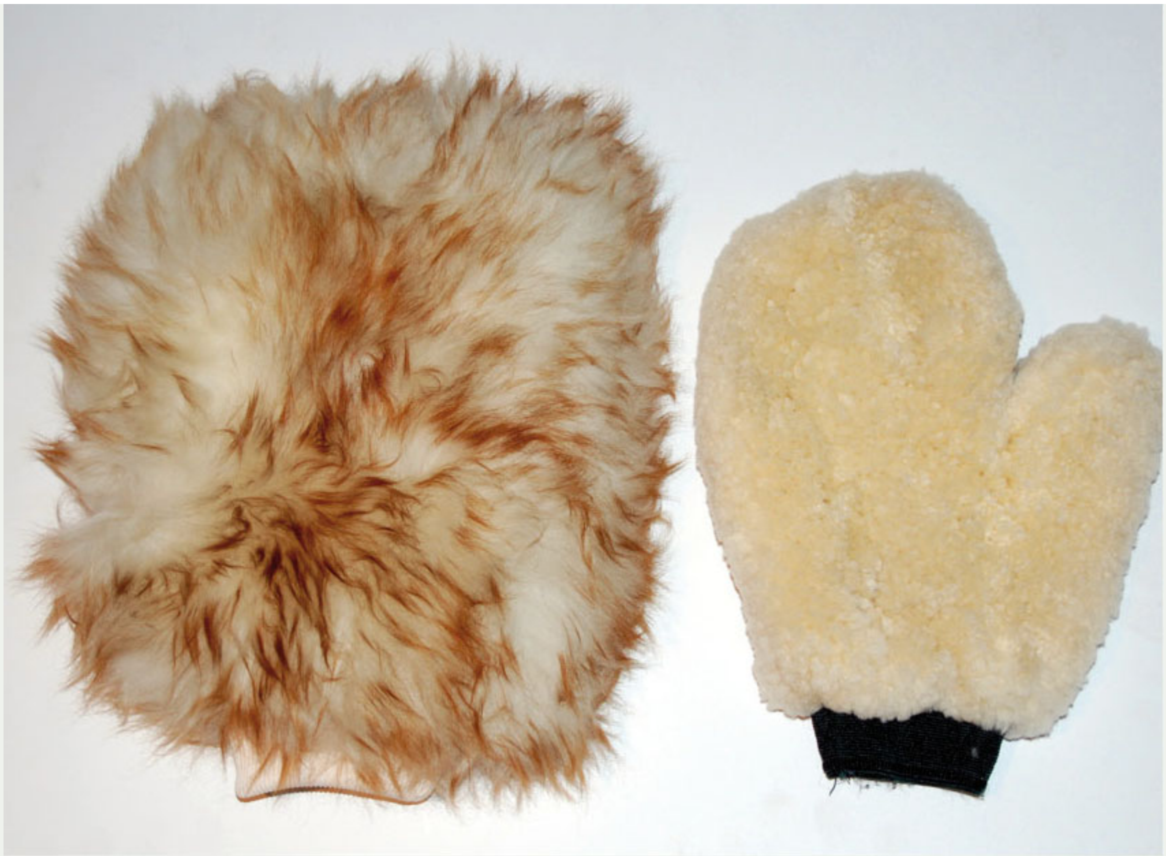

Dirt particles
on or in sponge surface
(easily removed and seen)
Dirt particles in mitt pile
away from paint, but more
difficult to see or remove
Sponge
Mitt

Sponge versus mitt.

There is a generally accepted opinion amongst detailers that mitts are superior to sponges, and prevent swirl marks. The reality is that a good wash technique and meticulous wash hygiene are the sole guardians preventing wash-induced marring. Mitts can be made from natural materials (wool, cotton) or synthetic textiles (usually microfibre), and it is the pile of the mitt that is the detailer's ally and at the root of their reputation. In theory, dirt migrates into the pile away from the paintwork, helping prevent swirl marks. The reality is that a mitt may give a false sense of safety: firm pressure could still sandwich dirt between the mitt and the paintwork; dirt could also be suspended close to the paintwork within the pile; and unless mitts are thoroughly inspected and cleaned between usage occasions then dirt could be captured in the pile, creating a marring risk.

Sponges, on the other hand, have no pile and can therefore trap dirt between the sponge face and the surface of the car. This is an obvious recipe for marring, but a combination of lubricated shampoo solution and stringent wash hygiene (checking the face of the sponge and removing any dirt particles before every stroke) will largely remove the danger. Indeed, sponges are far easier to check for contamination (and clean) than mitts, because the dirt doesn't tend to migrate anywhere. Note that sponge foam can be closed cell or open cell in structure. Opencell foam (such as that found in natural sea sponges) is often avoided because it allows dirt to migrate deep within the sponge, and therefore potentially travel out to the sponge surface at any time. As well as cell structure, the density of the foam (in pores per inch) should be considered – denser foams may hold more water and be 'smoother' in texture – and the type of foam is also important. Some foam materials are much softer than others, despite outwardly appearing the same.

KNOW YOUR MITTS AND SPONGES



The ultra-long-hair wash mitt has deeper pile, keeping dirt further away from the paint (in theory), but it can be harder to maintain.

Ultra-long pile-wool mitt (100 per cent natural): This is a long-hair merino mitt with natural pile and backing. Long pile theoretically allows for greater migration of dirt away from the paint surface, but it does require more care. After use it needs combing with a pet brush or comb to detangle the pile and remove entangled debris. Maintain it by hand washing only with water or specialist wool detergent (machine washing is strongly discouraged), then leave it to air dry with the cuff propped open – never tumble dry. Whilst natural mitts should be considered ‘wear items’ with a limited lifespan of six to twenty-four months only, the key to a longer period of service is regular use: this tends to prevent them fully drying out (which is when the wool pile may moult and stitching may stretch or break) or rotting (a risk if the mitt is left wet or immersed in water for long periods of time).

Standard wool mitt (100 per cent natural): Short and mid-pile lambswool mitts may not suffer from the tangled pile of their ultra-long pile cousins, but with a natural pile and backing they will be just as susceptible to premature disintegration. Again, these need to be used regularly to extend their lifespan; if they completely dry out or, conversely, remain immersed in water for long periods, failure will inevitably result. Maintain as the ultra-long pile wash mitt above.

Semi-synthetic mitt (part natural): These tend to have wool pile glued or stitched to a synthetic fabric or rubber backing, giving increased longevity. They have a shorter pile length and are less natural than the finest 100 per cent natural wool mitts, but are a more practical and economical choice (making them very popular amongst detailers). Whilst semisynthetic mitts are harder to inadvertently destroy, they should still be kept away from tumble driers and, if possible, washing machines. Rinsing after use with water and allowing them to dry naturally with an open cuff is the best maintenance method, but irregular use won’t lead to moulting because the backing isn’t made from hide and won’t dry out.

Microfibre mitts are far more durable than their wool counterparts, whether pile, micro-noodle or noodle in design.

Microfibre mitt: Microfibre has pile, can be very soft and is highly absorbent (assuming a decent polyamide/polyester ratio). This makes it suitable for use as a wash mitt material, but the pile is rarely long enough to win over the detailing public. Nevertheless, microfibre mitts are popular in applications where the pile length is perceived to be less critical, like glass, wheels and interior cleaning. The main benefit to microfibre mitts is ease of maintenance, cost and lifespan – if the stitching remains intact, a mitt can last for many years. Maintain by machine washing after use, with a non-bio liquid at 40 degrees (without the addition of fabric softener/conditioner).

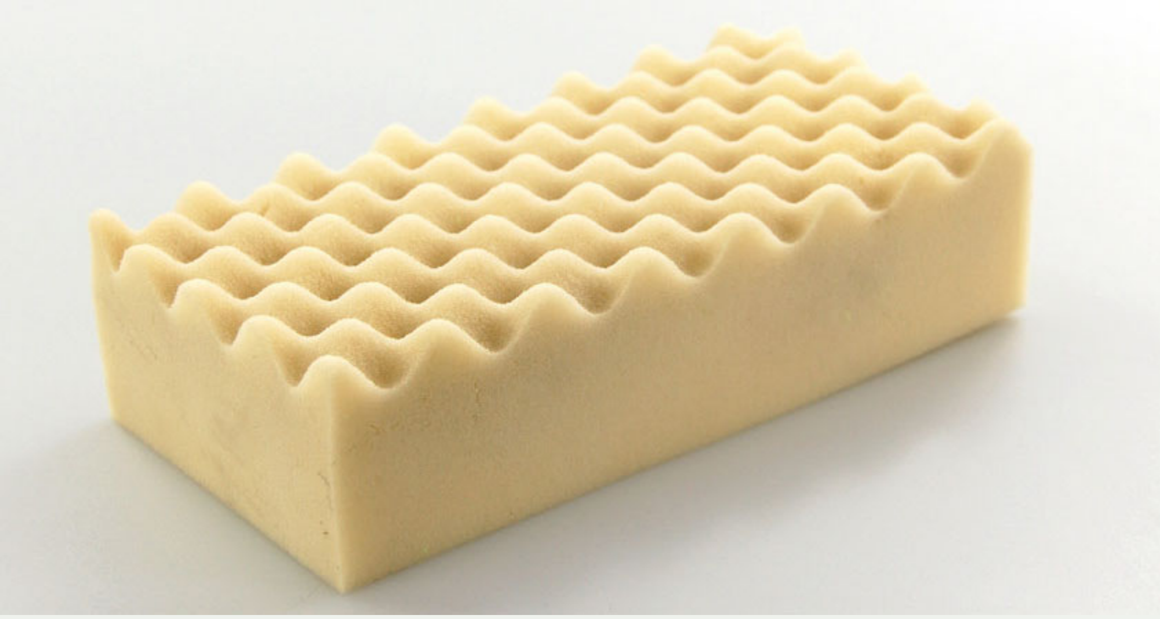
Microfibre noodle mitt: Noodles are stubby strands of matted microfibre, reminiscent of Rastafarian dreadlocks. These allow for a longer pile length, thus eliminating a traditional weakness of microfibre mitts. When choosing and using a noodle mitt, pay close attention to the webbing between the noodles – this can be coarser than the microfibre itself and may mar a soft finish if inadvertently rubbed into the paintwork. Like standard microfibre mitts, noodle mitts are easy to maintain and have a long lifespan. For maintenance, *see* microfibre mitt (above).

Microfibre micro-noodle mitt: This is a noodle mitt covered in a larger number of smaller microfibre strands. These ‘micro-noodles’ are a closer approximation of the wool pile found on natural mitts, yet have the softness and absorbency of the most modern microfibre materials. The mid-length microfibre tassels also help to keep the mitt backing away from the paint. These mitts are durable and can be machine washed and tumble dried; maintenance is the same as for a normal microfibre mitt.

SPONGE SPOTTING

The classic ‘Jumbo’ sponge. These are not made from the softest foam materials available, and the large pores may also allow for dirt ingress.

Standard polymer sponge: Typically made from a low grade polyester or polyurethane, these are the standard low-cost sponges that most car owners will use. Whilst there is nothing ‘wrong’ with these sponges, they are unlikely to be the softest sponges available and could mar soft finishes. The large pores may allow for dirt to enter the sponge, and this contamination may then be difficult to remove after use. To clean/maintain, rinse with a copious amount of water, wring, and then allow to air dry.



A traditional PVA detailing sponge; the small pore size helps prevent dirt ingress.

PVA sponge: Higher grade synthetic sponges may be made from polyvinyl alcohol (PVA), and whilst these have an open cell structure, the pore size can be extremely small, preventing dirt ingress. These sponges can be very soft as well, and have excellent absorbency. They are also easier to clean (due to the smaller pore size) and more robust than the cheaper synthetic sponges. A good choice for a high-end detailing sponge. Maintain as the standard sponge above.

Cellulose sponges are cardboard-like when dry and need to be saturated with water before use; their closed cell structure prevents dirt ingress, which is an advantage in detailing terms.

Cellulose/grout sponge: The cellulose sponge, often referred to as a ‘grout sponge’ due to the propensity of home improvement stores to sell them for this purpose, has many fans in the detailing community. This is because they can be extremely soft when saturated with water, despite being hard and ‘cardboard like’ when dry, plus they have a closed cell structure that prevents dirt migration into the deepest areas of the sponge. The final benefit is that cellulose sponges are made from wood pulp and are more environmentally friendly in manufacturing terms than other types of sponges. Despite these benefits, the large pore size and initial hardness (in the dry state) ultimately count against cellulose sponges. In usage terms, ensure that cellulose sponges are fully saturated before use, but maintain them in the usual manner (rinse with water, then allow to dry naturally).

The microfibre/foam wash pad is a good compromise, having the absorbency and robustness of a sponge, with a little pile to keep dirt away from the paint surface (because of the microfibre outer layer).

Microfibre-covered sponge: Sometimes called a wash pad or wash 'bone' (because of the shape), microfibre-covered sponges are a useful and costeffective alternative to sponges and mitts. They offer a soft, short-pile outer covering (that helps keep dirt away from the paint surface), wrapped round an absorbent foam core. Whilst the sponge inside may be basic, it doesn't need to be especially soft or have a small pore size because of the outer layer. This is a clever solution that gets around some of the traditional weaknesses of sponges. Maintain as a microfibre wash mitt, although note that there is a small chance of the sponge moving out of position if it is machine washed.

Hose and Hose Attachments

Mains pressure hoses are probably the most popular means of cleaning a car, suitable for pre-wash and rinse stages. Whilst mains pressure does not offer a great deal of cleaning power in itself, hose attachments can alter spray patterns and water-jet pressure. Spray guns may also dose the water being delivered with cleaning products, perhaps blending air with the mix to create higher foam solutions. Whilst these don't generate as much foam as dedicated foam lances attached to pressure washers, they may still prove useful.

Pressure Washers and Attachments (including Foam Lances)

Pressure washers range from basic, cold-water models to hot-water versions costing thousands of pounds.

The snow foam lance is the most famous pressure washer accessory (in detailing terms). It is also one of the most popular.

Pressure washers (also called power washers or jet washes) take a mains-pressure water supply and pressurize it further via a pump. This relatively simple process makes them devastatingly effective in detailing terms, and they are therefore one of the most important pieces of detailing equipment that can be acquired. The high-pressure blast of water can remove a wide range of contaminants – and even paint or clearcoat in a state of disrepair! – all without the need for chemicals (although these can often be added into the process, if required). When used in conjunction with waxed or sealed bodywork, it means that dirt can often be removed without the need for a contact wash, minimizing the chance of introducing swirl marks.

Pressure washers range from cheap ‘entry-level’ machines through to expensive diesel-powered hot washes costing thousands of pounds. Hot-water washes represent the ultimate in pressure-washer performance, especially if cleaning products are added to the heated, high-pressure water via a dosing system.

Whilst there are many accessories available for pressure washers, from underbody cleaning attachments to patio-cleaning lances, the most famous pressure-washer accessory in detailing terms is the foam lance. This mixes air and a high foam shampoo or TFR with the pressurized water to create a thick foam. The attraction of a thick foam is that coverage is highly visible, there is a long dwell time to enhance the action of the active ingredients, the foam action can help lift contaminants from the paint surface, and finally, foam ‘slip’ may help remove contamination from the paint after it has been ‘lifted’. Countering this is high aeration – the foam is weaker than a normal product mixture because it is heavily saturated with air molecules.

Steam Cleaners

Steam cleaners are capable of removing contamination from soft and hard surfaces simply through the action of high-temperature water vapour. Because chemicals aren’t required, steam cleaning tends to be classed as ecologically friendly, although they do consume electricity, and any microfibre cloths used during the cleaning process will need laundering after use. Whilst steam can be applied directly to a paint surface using a soft (typically microfibre) pad on the end of the steam lance, it is more normal to use a steam lance (without a pad) a few centimetres off the paintwork and allow the jet of steam to dissolve contaminants, which then run off in the condensed residue.

Water Filters and De-ionizers

This de-ionizing resin system uses refillable media; how often it is replaced depends on water hardness and the volume of water filtered.

De-ionized or highly filtered water, if zero parts per million (0ppm) in terms of quality, contains no limescale or other contamination. This means that a car can be rinsed with 0ppm water and allowed to air dry without the danger of water spotting, so drying can be achieved without the need for physical contact with the paint (which always comes with a risk of marring). The purification of the water will be via either physical filtration or, more commonly, some kind of resin (or salt) ion-exchange system. More expensive systems may use reverse osmosis. How the purity is achieved is in fact relatively immaterial: what matters is that mineral deposits are removed and that no water marks are left behind. Note that water filters are generally ‘wear items’ and need some kind of filter replacement or media replenishment. This can make them relatively expensive and somewhat of a luxury.

Bodywork Driers

Panel gaps are dried effectively with bodywork drying machines; they also prevent water evaporating on the bodywork (an instance when water spotting may occur).

Whilst not capable of removing contaminants from rinse water, bodywork driers can remove water from panel gaps and allow for a contactless drying process. Evaporation is needed for water marks to be created, so blowing the water off the panel with a strong, preferably hot, fan before the water has had a chance to evaporate by itself, can prevent unsightly (and potentially abrasive) deposits being left on the bodywork after rinsing.

Bodywork driers can be simple leafblowers meant for garden use, airline gun attachments, or dedicated hot air variants (typically based on compact driers for grooming dogs).

Drying Towels and Chamois Leathers

It is the pile that makes microfibre such a useful material for detailers, not just its softness, cleaning power and absorbency – the pile helps keep trapped dirt away from the paint surface.

Contact drying of paintwork is effective, but has an inherent risk of marring. This risk is increased if the drying material is harsh or lacks pile. Chamois leather, or synthetic chamois, can be soft (assuming it has been adequately soaked) but lacks pile, meaning that any dirt particles remaining on the paintwork after washing can be dragged across it during the drying process. Microfibre drying towels are generally preferred, especially those with a high polyamide count (because this increases absorbency), due to their implicit softness and pile depth. Waffle-weave microfibre towels are generally more absorbent as a breed, but are harsher in texture and could potentially mar the softest paint surfaces. This relative harshness also afflicts Terry cotton cloths.

MAINTAINING MICROFIBRES: A SIMPLE GUIDE

Microfibres that land on the floor should be discarded or relegated to 'secondary' use – they may have collected debris that even washing won't fully remove.

One of the most common questions asked by those new to detailing is 'How do I look after my microfibre cloths?' After all, detailers will use all manner of microfibres to dry, buff, and generally clean a car.

Firstly, inspect the cloth for loose debris. Microfibre can act like velcro, and a wide variety of contaminants will stick to it (that's what makes it so effective when it comes to cleaning. . . millions of filaments trap contaminants and abrade hard surfaces far more effectively than normal cloths with fewer fibres). Remove all the debris you can. If you have dropped the cloth on the ground and it is covered in twigs, grass or leaves, it may be beyond salvation and you should consider throwing it away rather than attempting to clean it. Hundreds of particles may have been trapped and you may only remove the obvious or large pieces of detritus. The damage to paint caused by a dirty microfibre could far outweigh the original cost of the cloth.

Next, wash it in a washing machine with a nonbiological *liquid* washing/clothes detergent or a dedicated microfibre detergent, at 30o or 40oC (30o for light contamination, 40o for heavier contamination). Liquid detergents won’t leave undissolved granules in the pile, whereas powders might. Wash dark colours separately from lightercoloured cloths – red is particularly susceptible to ‘running’. Do not use a fabric conditioner or softener as these can cause microfibres to become water-repellent or matted.

After the wash, tumble-drying the microfibre cloth at low temperatures may prove beneficial, softening and invigorating the pile. High temperatures can damage the delicate fibres or any glue present in the backing and should therefore be avoided.

Finally, check the microfibre cloth carefully after washing/drying. Some discoloration may be acceptable, but contamination that has resisted the wash process may be extremely stubborn (such as tar) and could compromise the cloth. If this contamination can be removed, the cloth can be saved; if not, the cloth should be binned or consigned for ‘secondary’ use only (*see* below).

Should drying towels have become waterproofed, perhaps due to exposure to spray sealants or inappropriate ‘drying aids’, these should be dry-cleaned using a solvent process. Solvents should remove waxes or sealants successfully, and restore absorbency. Note that not all microfibre is absorbent – some microfibre can be completely water-repellent. Absorbency can only be restored to towels that were absorbent initially.

If microfibre cloths are losing fibres during use, this could be due to the nature of the cloth (deep pile ‘super plush’ fabrics are the worst affected), the result of the cloth being applied to a rough, sticky or unclayed surface, or a failure of the cloth backing. Whilst fibre loss may be annoying, it can be tackled by rebuffing the paint surface with a soft, short-pile microfibre, perhaps in conjunction with a quick detailing spray.

Once clean, store your microfibre cloths in a covered container or containers, divided into 'premium' and/or 'standard' plus 'secondary' types. 'Secondary' microfibres should only be used on underbody areas, engine bays and so on.

Wash Blades

There is a high marring risk with wash blades that are used to dry bodywork, but they work well on glass and during wet sanding.

A wash blade (squeegee) is a flexible rubber blade used to clear substantial amounts of rinse water from glass or bodywork, so there is no need to dry the surface through absorption (with a chamois or drying towel). However, whilst effective and safe on glass and during certain detailing procedures – such as water removal during the wet sanding of paint – the chance of marring paint when drying the car with a water blade is relatively high. This is simply because the possibility of removing every single particle of dirt during the wash stage is low, and just one grain of contamination could create deep scoring if dragged across the paint surface: there is nowhere for dirt to go with a blade due to the hard, inflexible edge and the complete lack of pile. On the upside, wash blades are easy to maintain, durable, and relatively cheap to buy.

THE MAINTENANCE WASH STAGE

A safe maintenance wash, carried out with relative regularity, is critical to an effective detailing regime.

The maintenance wash is the regular washing process undertaken to remove light contamination and to quickly restore surface finishes to the highest levels achievable. It should be a quick and easy procedure, requiring little effort and little in the way of products. It is perfect for interim washes, to keep a vehicle clean and looking good.

Harsh cleaning products should not be employed, for a number of reasons. Firstly, there should be no need for them: a maintenance wash is for light contamination only. Secondly, stronger chemicals are likely to interfere with surface preparation or surface protection products that have been previously applied (mild products will help preserve any previously applied products, which only serve to enhance the finish). And finally, stronger products will invariably come with some form of adverse effect, whether an environmental cost, financial cost, or even just the increased chance of damage to sensitive surface finishes, and so they should not be used regularly or when milder products will suffice.

So how often should you carry out a maintenance wash? There are no set timings for performing a maintenance wash. As a light, interim wash, the regularity will largely depend on the following factors:

- How dirty the vehicle has become (a maintenance wash may be inappropriate if the vehicle is too contaminated)
- Whether you have a need or desire for the vehicle to be clean
- How much time you have available: there may not be time for more involved procedures

In other words, carry out a maintenance wash if there is enough contamination to remove, but not so much that it is difficult to remove with maintenance wash products and techniques. And whilst you could theoretically carry out a maintenance wash every week, or even more regularly, remember that marring of the paint surface can be introduced during a contact wash, and beneficial surface preparation or protection products could be eroded or compromised. So don’t be tempted to ‘over wash’. And conversely, never be tempted to wash if you don’t have the time or inclination to do it *safely*. It is better to leave a vehicle dirty and then wash it more meticulously and carefully another day, than to rush a maintenance wash and mar the finish.

THE MAINTENANCE PRE-WASH

A pre-wash is an essential part of any wash process: it removes the loosest debris, softens dirt, and provides some initial lubrication to the panels. Maintenance pre-washes are divided into basic and advanced types – a basic pre-wash can be as simple as a water spray. More advanced pre-washes will employ mild chemicals to boost the cleaning effect. Because water or mild chemicals are used and the process is contactless, a maintenance pre-wash should always be undertaken unless there is an overriding reason not to do so (for example, a severe water shortage).

BASIC (JUST WATER) MAINTENANCE PRE-WASH

The most basic type of pre-wash is one that simply ensures the surface to be cleaned is wet. The addition of a carrier (for example, water) will remove the loosest dirt and aid the safer removal of adhered particles at a later stage in the process. Try and use warm water if you can, as it is often more effective.

Using a Bucket or Watering Can

Always pre-wash, even if you only have a watering can or bucket available.

There is no shame in using a bucket or watering can; not everyone has a pressure washer, or even an outside tap outlet for a hose. If using a watering can, an open neck will soak surfaces more quickly than the gentle action of a sprinkler rose (type of spray head), but it is more inefficient and will not cover the surface as quickly: the decision rests with the detailer. If using a bucket, extra care should be taken because the tipping action increases the risk of contact with the paint surface as the bucket empties.

Apply the water from the top (roof) of the vehicle working downwards, area by area (glass areas, bonnet, boot, sides and lowers), as in the 'top down' technique described in more detail above. It may be beneficial to soak only a panel at a time on warm, dry days – then immediately contact wash the panel – because run-off and surface evaporation may dry the surface quickly, making a standard pre-wash less effective.

Using a Hose or Garden Pressure Sprayer

This is the level where efficient pre-washing begins. If you have access to a hose or garden pressure sprayer, firstly you will potentially be able to lift more dirt off the surface using pressure; secondly, you may be able to use an adjustable spray to regulate coverage and reduce water consumption; and thirdly, you'll have the advantage of a permanently connected water source – so no more lifting, carrying, or trips to and from the tap.

A hose attachment or sprayer that can control flow, pressure and spray pattern is preferable. A high pressure setting assists the removal of dirt, high flow helps soak the surface (conversely, a lower flow conserves water), and a wider spray pattern improves coverage (but may prove less effective at removing loose surface dirt than a more focused jet or spray).

So, working in the shade to prevent your modest water supply from evaporating too quickly, wet the wash surface from the top of the vehicle down (if only half the car is in shade, consider turning it around midway through the pre-wash). Loose material will be washed away with the run-off (increase water flow by means of an open spout if a spray proves insufficient), plus the adhered contamination will absorb moisture and become softer and easier to remove later on.

Using a Powered Pressure Washer

Always angle the pressure washer jet so it doesn't push dirt into the paint, and keep it away from the ground, and from vinyl stickers and peeling clearcoat.

If you have access to a pressure washer, water applied by medium pressure (approximately 80+ bar) from a distance of 30–50cm from the paint surface would be the next step up in pre-wash terms, as the mechanical force of the water will help in removing much of the surface contamination. This is far more effective than a hose, low-pressure sprayer or bucket, but it does use a lot of water in comparison – so there is an environmental consideration.

Once again, start with the roof and move around the car, gradually working downwards. Move the pressure spray in sweeping motions to remove as much contamination as possible, trying to keep the jet at 45 degrees to the bodywork (to avoid pushing dirt into the paint). Be careful when tackling the lower areas – dirt kicked up from the ground by a pressure spray could easily contaminate or even damage paintwork. Also be careful around door and window seals, and near vinyl stickers. The highpressure water could infiltrate the seals or lift sticker edges.

ADVANCED (CHEMICALLY ASSISTED) MAINTENANCE PRE-WASH

The effectiveness of a pre-wash can be boosted by the action of cleaning chemicals, but be careful to regulate their strength – anything stronger than a gentle pH-neutral cleaner could remove beneficial coatings. Should a more aggressive pre-wash be required, the steps for a decontamination pre-wash (below) can be followed. Try not to saturate the vehicle in chemical solutions of any nature, as the run-off will invariably be washed down a surface drain or soak into the ground, and this could have negative ecological effects.

Shampoo Solutions

A pH-neutral shampoo added to the pre-wash solution in the bucket or garden pressure-spray reservoir will increase cleaning power. For light contamination, dose the shampoo at a standard dilution, as if for a bucket wash; for a particularly soiled vehicle, double the concentration. Be careful not to use extremely strong shampoo solutions or degreasers during a maintenance pre-wash, because waxes and sealants that have previously been applied to the vehicle could be accidentally stripped. If using a pressure washer or hose attachment with a feed bottle, a suggestion would be to fill the feed bottle with shampoo at 10× standard dilution. The natural flow of water through the mixing head will ensure that a much weaker solution meets the paint. And just as with a 'plain water' pre-wash, a vigorous spray action and/or a warm water solution will enhance the cleaning effect.

Snow Foam

Foam washes or 'snow foams' also come in pH-neutral varieties, making them suitable for maintenance pre-wash duties. Because foam is essentially a highly aerated shampoo solution it is naturally quite weak, and therefore ideal for this task. For heavier decontamination, a stronger TFR (traffic film remover) foam wash would be needed.

When applying a layer of foam, it is still important to wet the car with plain water first in order to ‘prime’ the surface. Due to the gentler cleaning action of pH-neutral snow foam, the more dirt that can be moistened, disturbed or removed beforehand, the better. Use a pressured spray if possible, to increase the cleaning effect. Having wet the car, dose the feed bottle of the foam lance/gun. Playing around with the mixture setting and aeration/compression ratio will allow you a choice of foam types:

- A high foam solution that will cling to the surface, increasing dwell time and agitating the layer of contamination through the dynamic ‘bubble bursting’ action of the foam
- A reduced foam solution with lower air/product ratios, which results in a thinner foam layer that falls down the vehicle, dragging the contamination down with it

Thick foam dwells for longer but has little ‘drag’.

Neither foam type is necessarily better or more effective than the other. The reduced foam solution has a better ‘drag’ action and more movement, helping pull contamination from the surface, whereas the high foam solution tends to enjoy a superior dwell time (the duration of time a product is able to work on the vehicle’s surface, before removal). A longer dwell time generally increases the effectiveness of the foam solution being used.

The movement of a thinner foam may be beneficial in removing dirt in some instances.

Assuming that the contamination level of the vehicle is average, and that the ambient temperature and humidity are typical, a dwell time of five minutes or less is normally enough. In hot climates, where there is a danger of the foam ‘drying’ on to the bodywork, remove the foam lance attachment and rinse off the contaminated foam at high pressure before it has a chance to evaporate. (Rinsing and drying are covered in greater detail later in the book.)

Applying snow foam from the 'bottom up' rather than 'top down' increases dwell time, as more foam acts on the dirty lower areas of the car.

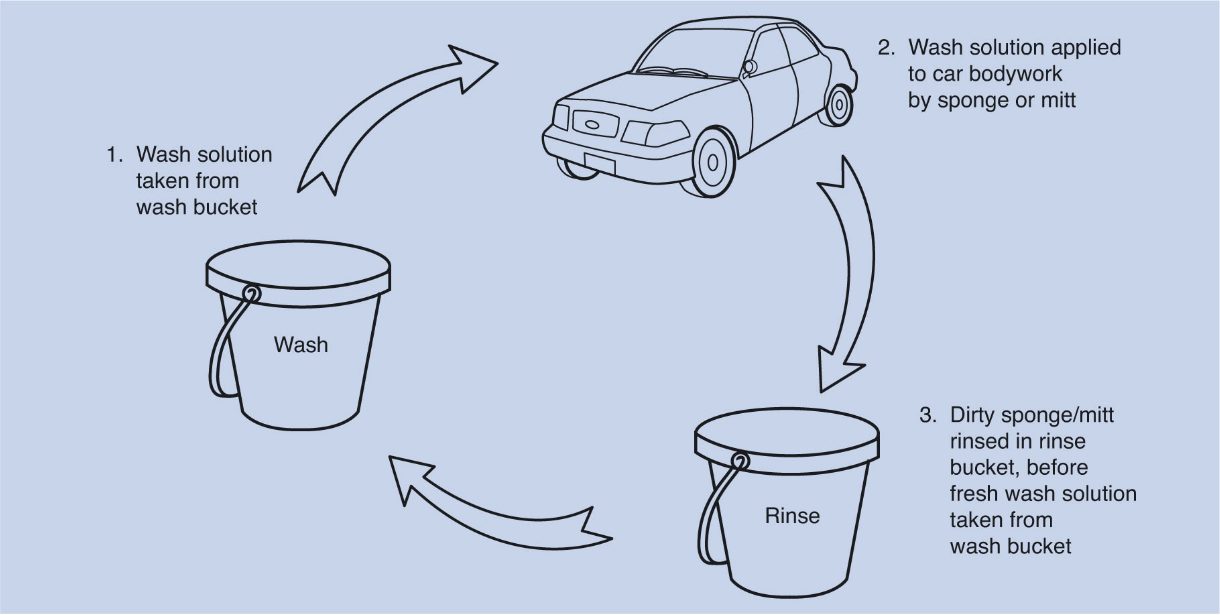
One point to note when using a snow foam is that whilst most cleaning products are applied 'top down', snow foam can be applied from the bottom of the car working upwards. This ensures that the most heavily contaminated lower areas get more foam, or at least more dwell time; clean foam slowly slips down from the upper parts of the bodywork, drenching the dirtier foam underneath it.

Now, on to the maintenance wash itself.

THE MAINTENANCE WASH

After completing the maintenance pre-wash, it is time to move on to the main maintenance wash. There are two basic types of maintenance wash: a contact wash and a non-contact (or 'contactless') wash. As you'd expect from the description, the difference is simply that contact washes involve wash equipment (a wash pad, sponge or mitt) making contact with the paintwork of the vehicle, whereas a non-contact wash relies simply on the action of the wash media to effect the cleaning. A contact wash is generally much more effective at removing contamination because the pressure, abrasion and agitation acting on the surface by a wash mitt or sponge is often more aggressive than the application of a water jet or spray (or the action of the cleaning solution by itself).

THE TRADITIONAL CONTACT MAINTENANCE WASH


1. Wash solution taken from wash bucket
2. Wash solution applied to car bodywork by sponge or mitt
3. Dirty sponge/mitt rinsed in rinse bucket, before fresh wash solution taken from wash bucket
Wash
Rinse

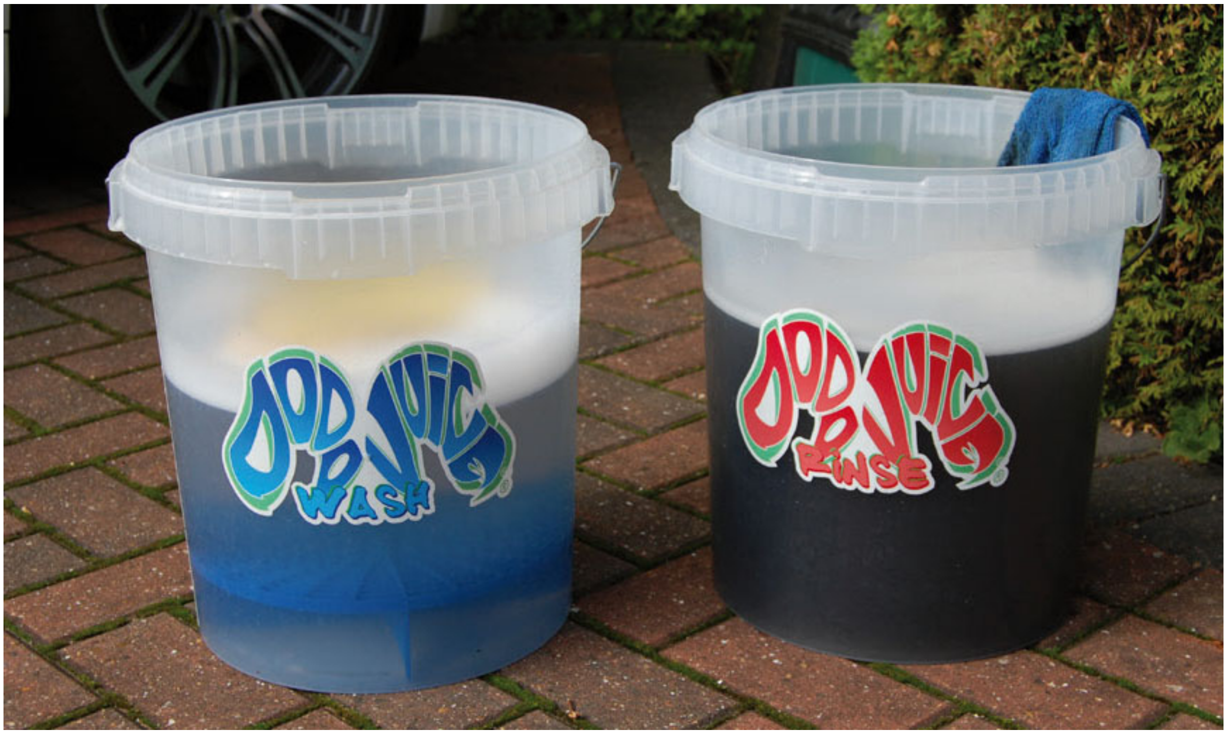
Twin-bucket method.

The ‘contact maintenance wash’ describes the traditional ‘twin-bucket’ or ‘two-bucket’ wash. The idea behind the two-bucket method (sometimes shortened to ‘2BM’ on the internet) is to keep the wash solution as clean as possible to prevent dirt being reapplied to the wash surface (and thus reducing the risk of accidentally inflicting swirl marks or other marring). The two-bucket method achieves this by using a second ‘rinse’ bucket to free contamination from the wash mitt following contact with the wash surface, before the mitt is reintroduced into the primary bucket containing the wash solution.

You will need the following:

- Two buckets, one for the wash solution – the ‘wash’ bucket – and the other for cleaning the wash mitt – the ‘rinse’ bucket
- A wash mitt (or wash sponge/wash pad)
- A pH-neutral ‘maintenance’ shampoo

Nine-Step Method



If carried out correctly, the wash solution should be relatively clean at the end of the wash, and the rinse water will be dirty.

1. Dose the wash bucket with shampoo and water according to the manufacturer’s instructions. (Remember that dilution ratios are a guide, and that for heavier contamination and in harder water areas, a little more shampoo may be required; likewise, you may be able to reduce the dosage in soft water areas on a lightly soiled vehicle.) Jetting water into the bucket from a hose will create additional suds, but foam doesn’t clean cars in itself, while soap does – so ensure that there is a sensible ‘solution to suds’ ratio, without excessive foam.
2. Fill the secondary ‘rinse’ bucket with water.

3. Submerge the wash mitt into the ‘wash’ bucket filled with wash solution.
4. Sweep the mitt, full of wash solution, across the wash surface, keeping an eye out for insects, leaves and so on, which may have landed on the paint surface since the pre-wash stage.
5. Submerge the mitt into the ‘rinse’ bucket, squeezing, agitating and even combing it with your fingers to release the collected contamination.
6. Squeeze/wring the mitt over the rinse bucket, checking its face and fibres to ensure it is free from contamination.
7. If the mitt is clean, repeat Step 3. If it’s not clean, repeat Steps 5 and 6.
8. Isolated tar spots and heavier contaminants (grease marks and so on) can be removed after the wash. If insect carcases have not been removed fully during the pre-wash and prove stubborn to remove during the maintenance wash, do not attempt to remove them at this stage. Come back to them later, using a neat shampoo solution dabbed on to a soft cloth, or remove them with a quick detailer spray. If that fails, use a dedicated bug remover or all-purpose cleaner (although this may affect layers of wax or sealant previously applied to the paintwork – so use it sparingly and cautiously).
9. Rinse and dry (*see* below).

After the wash, empty any remaining wash solution into the sink, rather than down the storm drain. This will ensure it is processed by the water company rather than draining into the water course. But before disposing of the rinse water, check how dirty it became during the wash process. . . had you been using only one bucket, all that contamination would have been in the wash solution and potentially applied to the bodywork of your car.

Also, it is worth noting that the water in the rinse bucket can be replaced as often as required – so if it becomes extremely dirty mid-way through the wash, replace it. This ensures that the mitt or sponge can be kept clean for the remainder of the wash.

The Low Water and Waterless Maintenance Wash

Washing a car in the traditional way uses a notable amount of water, especially if a thorough pre-wash has taken place initially. Water is nature's solvent, and in certain parts of the world it is in good supply. However, hosepipe bans and water shortages are more prevalent these days, and some countries may have arid conditions and/or forbid any kind of unlicensed run-off into street storm drains. Add in the rise of water meters and the fact that those living in flats or apartments may not have an outside tap, and the value of low water or 'no-water' or 'waterless' alternatives can be clearly seen. That said, the potential for swirl marks and marring may be higher with these methods, so an individual assessment must be made.

THE CONTACT, RINSELESS (LOW WATER) MAINTENANCE WASH

The rinseless wash uses less water than a traditional wash because the rinse stage can be omitted entirely. In theory, there is also less requirement for two buckets (*see* the two-bucket method above) because the rinseless wash will be specifically designed to lubricate dirt particles, making them less dangerous to paintwork if inadvertently reapplied during the wash. That said, the potential for marring paint with larger dirt particles is still present and the use of an extra few litres of water in a second bucket is modest, so this guide will describe the ideal rinseless/low-water wash, using a twin-bucket system.

You will need the following:

- Two buckets (one for the wash solution – the 'wash' bucket – and the other for cleaning the wash sponge – the 'rinse' bucket)
- A wash sponge or pad (even though a wash mitt could be used, many prefer using a sponge for a rinseless wash because they can be easier to inspect and clean throughout the process)
- A rinseless wash product
- Tar remover or quick detail spray for removing isolated stubborn contaminants

Ten-Step Method

Rinseless wash products save water and can be useful if cleaning a car away from home, say, at a car event.

1. Dose the wash bucket with the rinseless wash product and water, according to the manufacturer's instructions. The rinseless wash solution is unlikely to be foamy, as foam can capture dirt on the paint surface (inhibiting the rinseless wash

process), and lubricants in the wash will tend to suppress the formation of bubbles anyway.

2. Fill the secondary ‘rinse’ bucket with water.
3. Pick your panel – unlike a traditional wash, you will need to clean the vehicle in isolated sections, from the top down, rather than working your way around the car. Choose an upper area section first, and then work downwards.
4. Submerge the wash sponge into the ‘wash’ bucket filled with rinseless wash solution.
5. Sweep the sponge, full of wash solution, across the wash surface, keeping an eye out for insects and leaves and suchlike, which may have landed on the paint surface since the pre-wash stage. ‘Sluice’ the rinseless solution on to the panel, keeping panel pressure to a minimum.
6. Submerge the sponge into the ‘rinse’ bucket, squeezing it to release the collected contamination.
7. Squeeze/wring the sponge over the rinse bucket, checking its face to ensure it is free from contamination. You may find scraping the face of the sponge against the side of the bucket helps release any dirt.
8. If the sponge is clean, repeat Step 4. If it’s not clean, repeat Steps 6 and 7. Stubborn contaminants such as isolated tar spots, grease or insect remains should now be removed using dedicated cleaning products. Remember that aggressive products may remove wax or sealant previously applied to the car.
9. Once the panel or section has been cleaned, dry it with a small drying towel or deep-pile buffing cloth (being careful not to pick up dirt from neighbouring panels). Check the face of the cloth – if it is dirty, the wash has not been successful, so wash the panel again. If it is clean, buff the panel dry, to a high shine. It is important that the panel is absolutely clean before buffing, otherwise dirt could be ground into the paint surface.
10. Move on to the next panel, overlapping the previous panel slightly.

After the wash, empty any remaining waterless wash solution into the sink, rather than down the storm drain. This will ensure it is processed by the water company rather than draining into the water course.

MITT ETIQUETTE: THE RIGHT WAY TO WASH

Always inspect the face of the mitt or sponge every time you apply it to the bodywork, to guard against swirls.

As long as the wash solution is adequately delivered in sufficient quantity to the wash surface, and the face of the mitt or sponge is regularly inspected and cleaned, the mitt or sponge is being used in a fundamentally ‘correct’ manner. There are some finer points of mitt etiquette, though, that are worth touching upon.

Firstly, the mitt or sponge should only be used with light pressure: it is primarily a conduit for the wash solution. The actual friction or abrasion delivered by the mitt or sponge could also deliver marring, so it should be kept to a minimum whenever, and wherever, possible. Any contact is simply to loosen the dirt and allow for it to be washed away with the water and, in the case of a mitt, into the pile.

Secondly, the mitt or sponge should glide across the wash surface. If it drags, it may indicate that the wash solution is too weak, or that the wash surface is unprotected or, even worse, heavily contaminated (decontamination is covered later in the chapter. . . claying will invariably restore smoothness to the paint).

Next comes direction: do you wash in straight lines or in a circular motion? Well, in theory, a good wash technique with a soft sponge or mitt should mean no marring, whatever method is chosen. And even straight scratches will appear circular when a radial light source (such as the sun) shines on them – so trading circular scratches for straight ones is a folly. However, there is an ideal wash mitt direction, and that is working from front to back in straight lines, following the contours of the car. This is because contaminants come off more easily if they are removed in the same way that they are applied. As your vehicle travels forwards, air movement pushes contaminants over its surface, meaning that they naturally lie longitudinally. This can be seen most clearly with insect remains – ‘bug splats’ are typically long and thin longitudinal marks.

In an ideal world, following a sweep in one direction, the mitt would be rotated/turned so that a clean side would be used for the return sweep. Of course, these points of etiquette represent the height of theory and they are unlikely to be carried out in practice. Following them slavishly is also unlikely to make much of a difference to a wash regime, but they are still worth noting.

Finally, remember that keeping the face of the mitt or sponge clean throughout the whole wash is imperative if swirls are to be avoided. This means thoroughly rinsing the mitt in the second bucket, inspecting its pile carefully and combing/cleaning it fully after use to remove deeply held debris.

THE CONTACT WATERLESS (NO WATER) MAINTENANCE WASH

Waterless products are effectively strong 'quick detailer' products or soap solutions, applied liberally. They should only be used for lighter, non-granular contamination.

'Waterless' washes are spray products that wet and chemically clean the contaminated surface, whilst simultaneously lubricating the dirt being removed (to help prevent swirl marks and marring that would otherwise have been inevitable). Even so, there will always be a risk of inadvertent paint damage (especially if a pre-wash stage is omitted in accordance with the waterless objective) because the lubricants can only cope with smaller, smoother sedimentation. Large, coarse contaminants – such as grains of sand – will almost certainly mar paint.

This means that a waterless wash should only be considered if the vehicle has lightly soiled exterior surfaces, the contamination being (for example) dust, water marks, grease (such as from fingerprints) or grime. If mud or large dirt granules can be seen, a waterless wash should be avoided. Interestingly, the ecological allure of the waterless wash is somewhat compromised by the fact that in order to carry out the process effectively, multiple buffing cloths are required, and these will have to be washed afterwards with many litres of water and the use of chemical detergents. And the product itself will physically contain a small amount of water, added during manufacture. So it seems that cleaning a car can never be truly waterless.

Convenience is a major attraction of the waterless wash – just one spray bottle and a few buffing cloths theoretically replace buckets, wash mitts, shampoo bottles and drying towels. Even tar spots and bugs could be removed by stronger waterless washes (with enough rubbing), so specialist products may be unnecessary. There’s no need for a tap or hose: just spray and wipe.

Unfortunately, the reality is that waterless washes have a limited detailing role, which is the removal of light contamination only, for the purposes of a maintenance wash. It may not be possible to remove heavier contamination efficiently, and would certainly lead to the risk of marring.

For some car owners the waterless wash is the only option, but if you have a choice of wash systems, it should not be at the top of your list.

You will need the following:

- A waterless wash spray
- Multiple clean, soft buffing cloths

Six-Step Method

Waterless wash techniques rely on the heavy use of microfibre cloths, folded to maximize a clean surface area.

1. Pick your panel – unlike a traditional wash, you will need to clean the vehicle in sections, from the top down, rather than working your way around the car. Choose an upper area section first, and work downwards. If granular dirt or mud is present, there may be too much dirt to remove safely with a waterless wash on its own, and you may have to consider using water to sluice off the larger dirt particles beforehand (via watering can or hose. . . although using water during the pre-wash or wash stage obviously defeats the prime objective of a 'waterless' technique).
2. Spray the waterless wash liberally over the panel, and if ambient/panel temperatures allow, leave it to 'dwell' for at least thirty seconds. Do not let the waterless wash product dry on the surface – you should not be 'dry buffing' panels or marring could occur.
3. Wipe a soft, deep-pile buffing cloth lightly over the surface to remove the worst of the dirt, then fold it over.

4. Inspect the panel for tar spots and more stubborn contamination. Re-apply more waterless wash to the panel, and buff using the clean section of cloth, paying particular attention to isolated tar spots and so on. Fold the buffing cloth once more.
5. Re-inspect the panel and if it is clean, buff to a high shine. If contamination remains, re-apply more waterless wash, buff and inspect.
6. Move on to the next panel, overlapping the previous panel slightly.

Note that once the buffing cloth has been folded a number of times, it will be saturated with contaminants and waterless wash: no clean faces will remain and buffing will be difficult. It must therefore be set aside for laundry and a clean buffing cloth employed. It would not be unusual to get through half a dozen buffing cloths during the course of a waterless wash. If you use just one or two, you may be using too few, or the car may not have needed cleaning at all. If you use more, another type of wash system should perhaps have been employed (the car was simply too contaminated for a waterless wash to be effective).

After a waterless wash has been completed, there is less need to polish the paint, or add a glaze or quick detailer, compared to a ‘traditional’ wash. Waterless washes will generally contain silicone oils to lubricate dirt, and these will buff to a high shine. Shinier paint may also be seen after a rinseless wash or after the use of certain gloss-enhancing shampoos. Whilst this ‘quick shine’ is undoubtedly of benefit to many, it should not replace the prolonged and sophisticated polish/glaze stages if a higher-end detailing regime is being followed.

THE NON-CONTACT MAINTENANCE WASH

Swirl marks are so easy to inflict and so (relatively) difficult to remove that a non-contact maintenance wash, performed regularly before extreme contamination can build up, is the detailer’s dream. In theory it should mean correcting the paint on a car once, and then simply maintaining the finish with a non-contact maintenance wash for ever more, preserving its beauty. Unfortunately, the nature of contamination (often heavy or stubborn) and protective coatings (that may absorb contamination, degrade and need replacing) means that this ideal could remain a dream. But for light contamination, when conditions permit, a contactless wash can be an effective procedure and can certainly minimize – or even eliminate – the risk of marring paintwork.

It should be noted that a contactless wash is going to work best with a well maintained (protected) vehicle, and that a pre-wash with a pressure washer is extremely important – if not essential. Even then, it will not be suitable for heavily contaminated vehicles. There is only so much that water pressure and chemical cleansing can do. Also, it can use a lot of water, making it less ecologically friendly than rinseless or waterless wash systems (which would also be suitable techniques for removing light contamination).

You will need the following:

- A pressure washer and foam lance
- A pH-neutral ‘maintenance’ shampoo or snow foam
- A filtered water system for the final rinse (advised)

Five-Step Method

Filtered water for the final rinse will be essential in hard-water areas to prevent water spotting when carrying out a contactless wash.

1. Pre-wash the vehicle thoroughly, using a pressure washer (a pH-neutral snow foam could also be employed at the pre-wash stage if not being used for the main contactless wash).
2. Starting from the top of the car working downwards, apply a strong shampoo solution (typically 10× more than for a normal wash) via the feed bottle of the foam lance. It is unlikely to foam like a dedicated snow foam, but increasing the air mix to the maximum level should create some bubbles. The ‘slip’ down the car will be faster than with a foam, and the dwell time decreased, but the wash mixture should still have a good effect.
3. Rinse off the foam with a pressure washer, and repeat Step 2.

4. For the final rinse, the use of a filtered water system is advised, to prevent water marks.
5. The car should now be clean enough to leave to air dry.

THE DECONTAMINATION WASH STAGE

If the vehicle has heavier contamination – say, for example, if it hasn't been washed for a few weeks, or mud or large grains of dirt can be seen on the paint surfaces – then a maintenance wash may be insufficient to adequately clean the vehicle and a decontamination wash will be required. A decontamination wash is also recommended if 'old' wax or sealant needs to be removed, either as part of a 'spring clean' of the paintwork or before fresh products are applied.

THE DECONTAMINATION PRE-WASH

The pre-wash is crucial when decontamination is required – this is when the larger and more prevalent contaminants will be removed. It is advised never to complete a decontamination wash without a suitable pre-wash beforehand.

BASIC (JUST WATER) DECONTAMINATION PRE-WASH

Note that the bucket and watering-can methods will be insufficient here. A hose with a 'jet' spray attachment, or a pressure washer, will be required at the very least.

Hose with 'Jet' Spray Attachment

Although a hose with a 'jet' spray attachment will not be as effective as a pressure washer, it will suffice for a basic decontamination wash. Note that the attachment is necessary: a standard hose will not generate the pressure required for an adequate decontamination pre-wash. The technique is much the same as for the basic maintenance pre-wash. Work in the shade to minimize evaporation, and wet the wash surface from the top of the vehicle down.

Take care around door seals and windows, although most hose attachments will not have sufficient power to breach them. If spraying close to the paint to maximize the effect of the water jet, do so at 45 degrees to prevent forcing dirt into the surface – and be careful near vinyl stickers as the force of the spray could lift the edges.

Powered Pressure Washer

A pressure washer is ideal for a decontamination pre-wash, removing loose dirt and even the more stubborn underlying layers of contamination. Apply the water spray at medium pressure (around 80 bar should you have a choice, or from further away with more powerful machines) in sweeping motions from a distance of 30–50cm from the surface (move the spray further away to decrease cleaning effect and pressure, and shorten the distance to increase cleaning power/pressure – though 15cm should be a minimum, as the lance could damage paint if it comes into contact with it directly).

Start from the roof and wash top down, moving around the car, whilst trying to keep the jet at 45 degrees to avoid pushing dirt into the paint. If more cleaning power is needed, increase the pressure or decrease the distance to the paint surface. Take particular care around door and window seals, and near vinyl stickers, to prevent water ingress or the stickers peeling. Also, be cautious when using the pressure-washer lance near damaged paint (for example, stone chips or flaking clearcoat) as a good pressure washer can exacerbate the damage with worrying ease.

With skilful and careful use, however, the mere action of water through a pressure washer can elicit impressive results on a heavily contaminated car without undue ill effects, cleaning it to a degree where many motorists would be tempted to call the task ‘complete’ – all without having to rely on the action of harsh chemicals. Note, however, that a large amount of water will be used in the process, so a pressure washer pre-wash could never be considered truly environmentally friendly.

THE ADVANCED DECONTAMINATION PRE-WASH USING TFR/APC

Direct spray application may be more effective than applying foam when using TFRs and APCs, but don't allow it to dry before rinsing/removal.

If the contamination isn't just heavy, but persistent – perhaps because it has been baked on by the sun or left to accumulate over many weeks or months – some chemical assistance may be needed. This takes the form of a traffic film remover or all-purpose cleaner (a similar but weaker product compared to a TFR), either applied as a 'neat' spray or as a snow foam solution.

Traffic film removers are typically caustic detergent/solvent solutions, strong enough to remove grease and grime – and previously applied wax or sealant (even advanced nano-ceramic sealants can be eroded by strong alkaline products). All-purpose cleaners tend to be based around similar but weaker formulations. Therefore neither should be used for a maintenance pre-wash, where the preservation of beneficial coatings is desired.

A direct application of traffic film remover (TFR) or all-purpose cleaner (APC) at the correct dilution in spray form is likely to be the most effective technique. Although there are TFR snow foams, their impressive dwell times are going to be countered by their substantial aeration (this weakens the active mix considerably).

If you wish to carry out a decontamination prewash but don't have any TFR or APC, try spraying or foaming a strong shampoo solution (use double the standard concentration). A strong dishwashing liquid could also be sprayed on to panels, although this would not be recommended for older or damaged paints – the salt crystals in dishwashing liquid can be difficult to remove from the cracks and pores in UV-damaged paint or flaking clearcoat, and these crystals will expand and contract when they come into contact with subsequent moisture, damaging the paint further.

Should the vehicle have a lot of tar contamination, a dedicated tar remover sprayed on to the affected areas will be more effective than a TFR or APC used in isolation. Any remaining tar spots can be removed at the end of the pre-wash stage (as described below), or removed later, after washing. Remember that it is better to use stronger and task-specific chemicals in smaller amounts for isolated areas than covering the vehicle repeatedly in generic chemical washes to get a similar effect.

For a TFR/APC pre-wash, you will need the following:

- A pressure washer and, if relevant, a foam lance
- A TFR spray, snow foam or all-purpose cleaner
- A tar remover, should tar contamination be substantial

Seven-Step Method

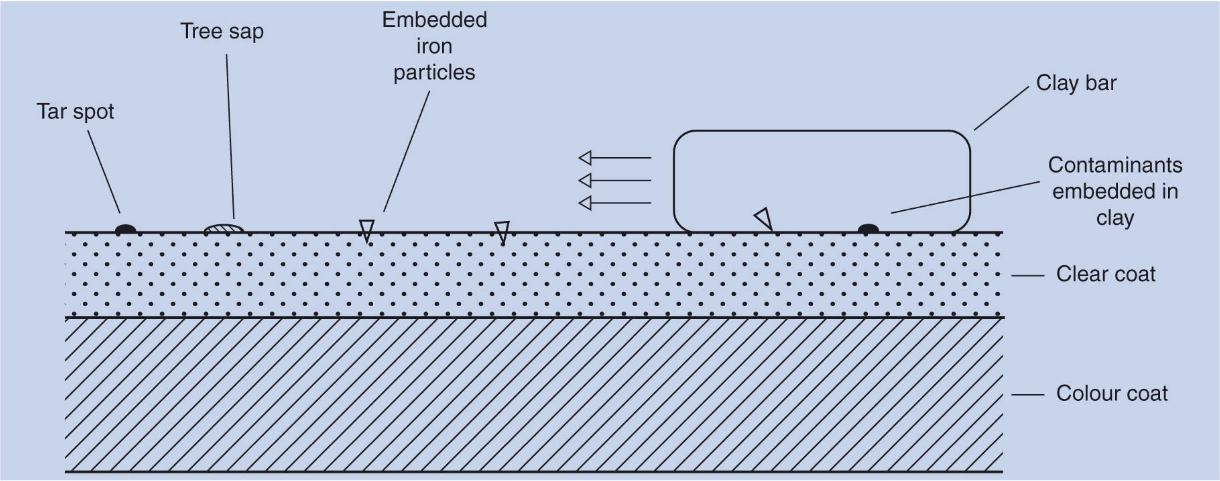
1. Pressure wash the car with plain water to remove loose contamination and surface dirt.
2. If the soiling is mainly on the bottom half of the car, apply the product to those areas only. If the entire car needs decontaminating, cover the car with TFR or APC, from the top down (if a spray) or from the bottom up (if a snow foam). Dwell time will be critical to the cleaning effect achieved: the longer the dwell time, the greater the cleaning effect. However, a long

dwell time could come with a hidden cost, because the caustic nature of TFRs means that sensitive finishes may be dulled or tarnished – typically chrome or brushed metal plating to roof rails, radiator/grille surrounds or window trim.

3. Rinse the car with a pressure washer thoroughly. TFR residue left unchecked to dry out or remain working around badge surrounds, under trim panels or behind grilles could damage the immediate area.
4. If required, repeat Steps 2 and 3. Otherwise, move on to the decontamination wash.
5. If there is substantial tar contamination, spray the tar remover on to the panels and allow it to dwell; you will see the tar ‘melting’. Do not spray tar remover on to unlaminated vinyl stickers, in case it removes the print.
6. Rinse the car thoroughly once again, being extremely careful around vinyl stickers if using a pressure washer; the solvents will attack glue and the pressure washer could lift vinyl edges (more easily than it would do normally) in these circumstances.
7. If required, repeat Steps 5 and 6.

For an even more aggressive decontamination prewash, consider introducing a fallout removal stage. This will attempt to remove embedded metal particulates that may be present in the paint. You could use a fallout remover after the wash stage (as part of a paint preparation regime), but early removal of contaminants is always preferable: there is less risk of the contamination marring the paint or soiling cleaning mitts, pads and cloths at subsequent stages.

THE ADVANCED DECONTAMINATION PRE-WASH INCLUDING FALLOUT AND TAR REMOVAL



Contamination on/in the paint surface, including metal 'fallout'.

‘Fallout’ generally refers to metal particulates that have landed on the paint and then (typically) become embedded in some way. These microscopic metal particles may have industrial origins or have come from the thundering passage of trains (or trackcleaning devices) on nearby railway lines – but more often than not they are simply the metal debris from brake pads and brake discs, created by every vehicle on the road and churned up in the vortices of moving wheels. Because these tiny metal particles tend to have jagged edges and are harder than the ‘plastic’ paint surfaces found on cars, they can stick in, or sink into, the softer surfaces they land on (particularly if pushed deeper into the surface during washing or polishing). And if that surface is already partially damaged (due to UV damage from the sun’s rays) then there is even more potential for these particles to anchor themselves into or on to the paint.

Removal of fallout particles can be achieved using a clay bar or decontamination mitt/pad (*see* below), but a strong pre-wash using dedicated chemicals can help soften, partly dissolve or even completely remove metal contamination of this type at an early stage.

Note that the chemicals used during this process can be extremely strong, and will need to be handled and used carefully. Failure to do so could lead to permanent damage to sensitive finishes on the vehicle, especially metal trim on roof bars or around windows.

You will need the following:

- A pressure washer and, if relevant, a foam lance
- A TFR spray, snow foam or all-purpose cleaner
- A tar remover, if there is substantial tar contamination on the car
- A fallout remover product or fallout removal system

Eight-Step Method

1. Pressure wash the car with plain water to remove loose contamination and surface dirt.
2. Cover the car with TFR or APC, from the top down (if a spray) or from the bottom up (if a snow foam). A longer dwell time will result in a greater cleaning effect, but be careful with caustic TFRs used on sensitive finishes – if the dwell time is too long, or solution strength too strong, the finishes may be adversely affected.
3. Rinse the car thoroughly with a pressure washer.
4. Apply the tar remover (if there is substantial tar contamination) to the affected areas.
5. Rinse the car thoroughly with a hose – or pressure washer on a low pressure setting/sprayed from a distance – being extremely careful around sticker edges.
6. Apply the fallout remover, following the product instructions carefully. It will normally be sprayed on to the bodywork neat, and left to dwell. Some fallout removers will change colour when they react with contamination – note that this colour change is merely a reaction that shows contact with the contamination, and not necessarily a sign that it has been fully removed. It also does not necessarily indicate the presence of embedded contamination. Metal particles on the surface that have not been removed in the previous stages will also show a reaction/colour change.
7. Rinse thoroughly with a pressure washer.
8. If the vehicle appears to be particularly contaminated, repeat Steps 6 and 7.

A simple water rinse (Step 7) will be enough to complete the pre-wash if the fallout remover is pHneutral, or takes the form of a ‘neutralized’ system (where separate acidic and alkaline components are used). However, if the fallout remover is acidic – as some are – it could be worth reapplying a TFR solution to the paint to neutralize any acidic residue that may remain in panel gaps, under trim and around badges. After applying the TFR solution and allowing to dwell for a suitable period of time, rinse thoroughly with water from a pressure washer.

Once the decontamination pre-wash is complete, move on to the decontamination wash itself.

THE DECONTAMINATION WASH

After the pre-wash stage, much of the contamination will have been removed. A contact decontamination wash will enhance the cleaning programme even further – and remove even more dirt from the surface of the paint. Note that there is no point in having a decontamination rinseless, waterless or contactless wash. The rinseless and waterless washes suit the removal of mild contamination only – heavier decontamination needs a traditional twin-bucket wash. And a contactless wash will not clean beyond the realm of the decontamination pre-wash, meaning that it will most likely be a futile additional step.

TRADITIONAL CONTACT DECONTAMINATION WASH

Like the traditional contact ‘maintenance’ wash, the decontamination contact wash uses the twin-bucket method. If the pre-wash stage has been successful, the vehicle should be free from heavier contamination at this point. However, if the water in the rinse bucket – or even the wash bucket – starts to become heavily polluted, empty the buckets and refresh the wash solution/rinse water, mid-way through.

You will need the following:

- Two buckets (one for the wash solution – the ‘wash’ bucket – and the other for cleaning the wash mitt/sponge – the ‘rinse’ bucket)

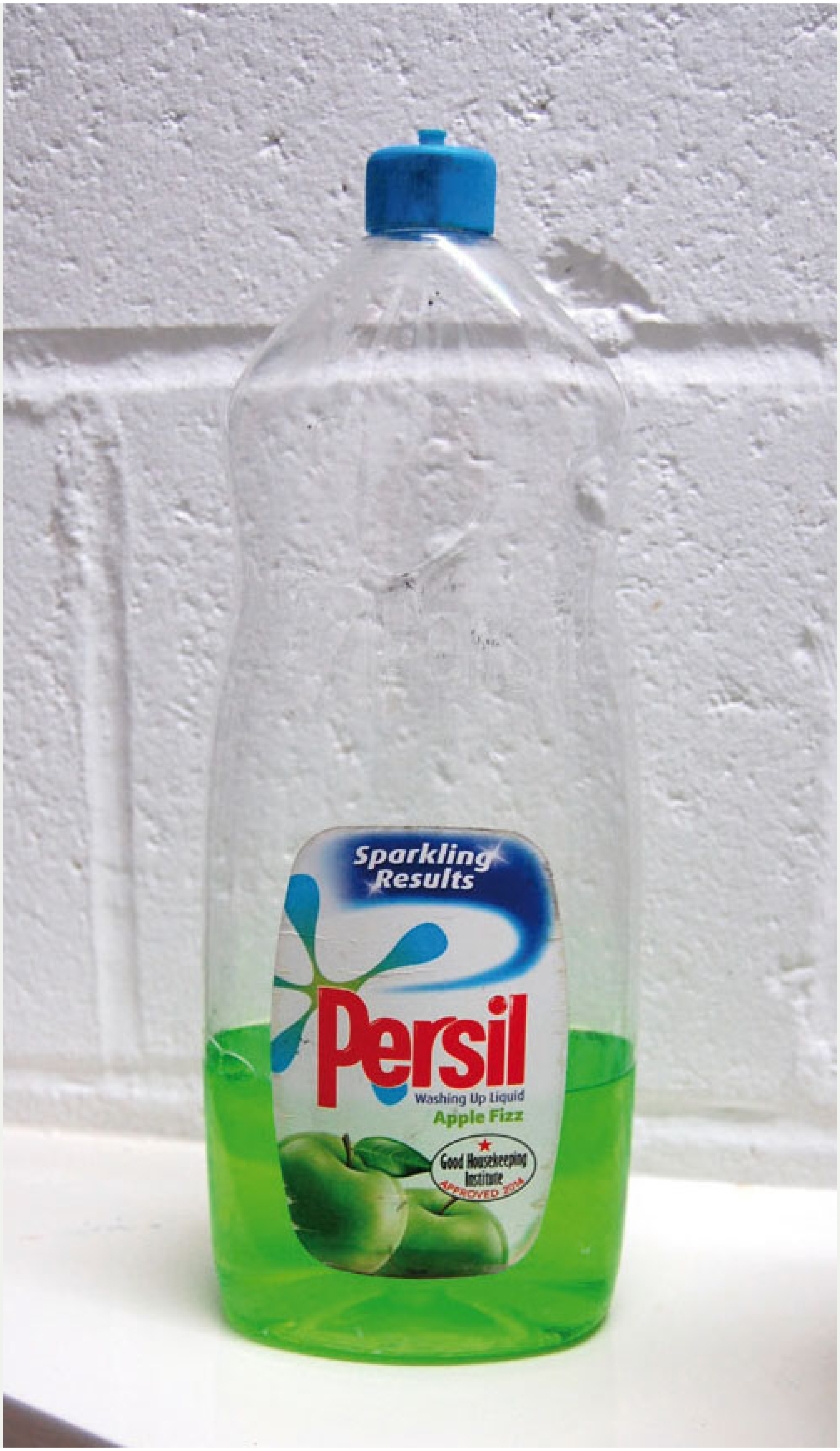
- A wash mitt (or wash sponge/wash pad)
- A strong shampoo with a high detergent content (some people use household washing-up liquid as a detergent, but there are various reasons why this is far from ideal – *see* text box). A dash of all-purpose cleaner could be added to a regular ‘maintenance’ shampoo solution to create a stronger mixture, if required

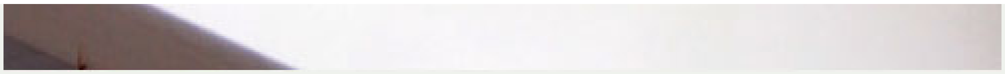
Ten-Step Method

1. Dose the wash bucket with a decontamination shampoo and water according to the manufacturer’s instructions. If you only have a regular ‘maintenance’ shampoo, consider using it at twice the recommended strength, or add a small amount of APC to it.
2. Fill the secondary ‘rinse’ bucket with water.
3. Submerge the wash mitt into the ‘wash’ bucket filled with wash solution.
4. Sweep the mitt, full of wash solution, across the wash surface, keeping an eye out for insects, leaves and so on, which may have landed on the paint surface since the pre-wash stage.
5. Submerge the mitt into the ‘rinse’ bucket, squeezing it to release the collected contamination; agitating and finger-combing the mitt may help release more dirt/debris.
6. Squeeze/wring the mitt over the rinse bucket, checking its face and fibres to ensure it is free from contamination.
7. If the mitt is clean, repeat Step 3. If it’s not clean, repeat Steps 5 and 6.
8. Check the wash and rinse water periodically. If necessary, empty one or both buckets and repeat Steps 1 and 2.
9. After a decontamination pre-wash and wash, very few contaminants should be visible on the paint surface, but some isolated tar spots and insect carcases may remain. These can be removed later, after rinsing, using a neat shampoo solution dabbed on to a soft cloth, ‘cleansing’ quick detail sprays, and APC or dedicated tar/insect removal products.
10. Rinse and dry (*see* below).

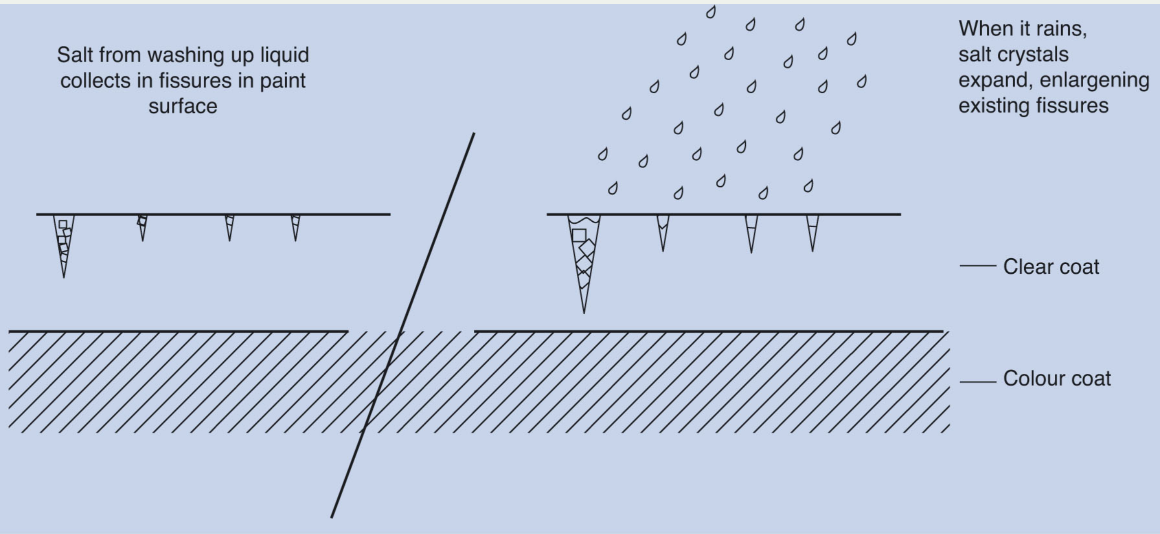
After the wash, empty any remaining wash solution into the sink, rather than down the storm drain. This will ensure it is processed by the water company rather than draining into the water course.

WASHING-UP LIQUID: DECON FOR DUMMIES?


Sparkling Results
Persil
Washing Up Liquid
Apple Fizz
Good Housekeeping Institute
APPROVED 2014



Washing-up detergent is routinely used by the general public to clean cars, but whilst it is effective on glass, it can be mildly destructive to paint in certain circumstances.


Salt from washing up liquid collects in fissures in paint surface
When it rains, salt crystals expand, enlargening existing fissures
Clear coat
Colour coat

Salt ingress/damage to paint.

No one knows when dishwashing liquid was first used to clean a car, but it is certainly one of the most popular ‘amateur’ products, and thousands of litres will be used every weekend to decontaminate dirty cars. The good news is that washing-up liquid is cheap and easily procurable – years of research into grime and grease removal on cakedon foodstuffs means that it has a strong and effective action against many types of contaminant. It is particularly effective on windscreens and other glass surfaces; the formulations have been carefully honed to get glassware clean and leave them as residue-free as possible, for a clear and sparkling post-rinse result.

This comes at a cost for car owners, though, especially if the vehicle is more elderly and the paint is showing signs of UV (sun) damage (faded red cars are the classic example). The reason is relatively simple: salt.

Salt is used in washing-up liquids as it is a good thickening agent, excellent at cleaning glass, and it also acts as a water softener; this is why most dishwashers will have a separate salt dosing chamber. The problem is that it is hygroscopic – it absorbs water – at a microscopic level. When used on car paintwork that is suffering from early UV-degradation or on chipped or flaking clearcoat, the salt crystals will be caught in the invisible craters, fissures and cracks in the paint surface. When it rains, the salt crystals expand when they absorb moisture, enlarging the fissures they are in, or flaking the paint even more.

For this reason it is advised that washing-up liquid is never used to clean paintwork of cars more than a few years old, cars with 'solid' (unclearcoated) red paintwork (which is particularly susceptible to UV degradation), and cars with any kind of paint damage already (including stone chips or deep scratches). This rules out many cars, so it is best to avoid washing-up liquid altogether, or use it solely for the glass. And remember, it should never be used during a maintenance wash as it will try to strip oils, waxes and even some sealants due to its strong cleaning action. It is a decontamination product only.

POST-WASH: RINSING, SPOT CONTAMINATION REMOVAL AND DRYING

After the pre-wash and wash, the vehicle will be substantially clean. But even then, some spots of isolated contamination may remain (particularly if it was just a maintenance wash). These can be removed after rinsing, before drying. If you attempt to dry the car with these contaminants present, any drying towels used could become contaminated. Firstly, however, the car must be rinsed clean of wash residues (for example, contaminated soap solution).

THE RINSING STAGE

Rinsing is always recommended after using prewash and wash products, to carry away any product residues and dirt that may remain.

The process of rinsing is where you remove any remaining wash/product solution from the vehicle, carrying away soap/product residue and contaminants. It is necessary after using any form of cleaning product, whether at the pre-wash stage or wash stage – unless, of course, you are carrying out a rinseless or waterless wash.

Whilst some may argue that rinsing isn't strictly required after the pre-wash stage, especially when there is an ecological reason to reduce water usage, from a technical point of view it is always a better course of action to rinse. Not only does it remove pre-wash soap residues and any remaining dirt, it also helps maintain the wetness of the area that is still to be washed. Note that it is important to rinse soon after a pre-wash or wash – and absolutely critical if ambient temperatures and/or panel temperatures are high. If the pre-wash or wash residue dries on to the surface it could be difficult to remove, and the chance of marring the paint during removal is increased.

THE TRADITIONAL RINSE

Whether using a bucket, a watering can, hosepipe or pressure washer, the principles of rinsing remain roughly the same: start from the top of the vehicle and chase the soap bubbles/residue down the surfaces and off the car until the residue has completely disappeared. If using a hose or watering can, avoid using a spray setting; an open hose or spout will reduce water beading on paintwork, helping water to run off the car and minimizing water marks.

When a pressure washer is used, a lower pressure/greater distance can be employed (cleaning is not required, just light residue removal); spray at forty-five degrees to the paint as in the pre-wash, and be very careful near the lower areas of the car and wheel arches – dirt can be inadvertently kicked up from the ground on to clean areas.

If the residue has dried, see if it comes off with the rinse. If it can't be easily removed, repeat the pre-wash, or wash and rinse again (although small patches of dried residue may be more conveniently removed using a quick detailer spray). If rinsing isn't successful, streaks from soap, contamination or product residues may be seen on the paintwork, resulting in a higher incidence of water marks, dirtier drying cloths and a greater chance of marring during the drying process.

Rinsing thoroughly after the decontamination pre-wash and wash stages is particularly important because the contamination and products used will be stronger. If an aggressive chemical ingredient (found in TFRs, APCs and fallout removers) is not rinsed from grilles, badges, window seals and other trim, it could attack sensitive finishes or even discolour paint if left to dry on it in a concentrated state.

THE PARTICULATE-FREE (0PPM) RINSE

Water in hard-water areas can typically be 300–400ppm (particles per million), resulting in extensive water spotting if allowed to dry on car bodywork. The reading here is 307ppm.

Although a rinse can remove wash residues, the water used for the rinse may contain microscopic contaminants, most noticeably limescale. These contaminants can result in water marks if they are allowed to precipitate out through evaporation, and therefore timely drying is a necessity – unless filtered water is used. De-ionizing resin (DI) and reverse osmosis (RO) systems allow for low or zero particulate (often referred to as 0ppm to signify ‘zero parts per million') water to be used for rinsing. In theory, this could mean a contactless drying process, or even no drying stage at all.

Bottled water is far from 'pure' as it contains mineral deposits – in this case, 145ppm.

Start from the top of the vehicle and chase the soap bubbles/residue down the surfaces and off the car until the residue has completely disappeared. Filtered water is precious, so consider rinsing 'normally' first, and then using filtered water for a final rinse only. To conserve filtered water you could use a watering can rather than running filtered water through a hose – this may be more economical. And remember that most filter systems require time to work and can only cope with a certain amount of water treatment at a time. The first few litres used from a DI canister may be 0ppm, yet subsequent water may be largely untreated.

DI water will usually range from 0–30ppm, depending on the filter system used. This reads 003ppm.

Also, regularly check the condition of your filter: a 0ppm filter in a hard-water area will run out faster than a 30ppm filter in a soft-water area. Some small filters may only last a couple of dozen washes before they stop functioning efficiently. Using incompletely filtered water will have little benefit, so check the quality of your filtered water by using a cheap electronic water-hardness gauge, or by pouring some water out on to a reflective surface (a small mirror may work well) and allowing the droplets to dry.

REMOVAL OF ISOLATED SPOT CONTAMINATION

Stubborn contaminants, such as tar spots, tree sap and insect residues, may remain after the pre-wash or wash stages (more so with maintenance prewashes and washes). Whilst a decontamination pre-wash could involve the use of a dedicated tar remover, the solvents used tend to be very strong, and a ‘blanket’ application over the entire car may be wasteful or overly aggressive if the contamination is isolated to just a few bugs or spots of tar. ‘Spot’ removal of these is recommended instead, after the main pre-wash or wash.

So why treat isolated contaminants specifically? Well, there is more chance of removing the contaminant more successfully, with less effort, by using a targeted technique and a dedicated product. It is more economical and ecological in terms of chemical application as cost and run-off are both minimized. And there is also less chance of damaging the surrounding paint (or beneficial coatings) by treating the contaminant in isolation, rather than dosing the whole panel.

SPOT CONTAMINATION REMOVAL

There are different types of contamination commonly removed in isolation; these are tar (and petrol/diesel stains), insect remains, tree sap, resin and pollen, water marks (water spots) and ‘other’ spot contamination.

Tar and Petrol/Diesel Stains

Tar is a common contaminant, seemingly appearing from nowhere and peppering the lower bodywork.

Small spots of tar – particularly prevalent during the summer months when road bitumen may melt and be splattered by passing cars – can be removed with a solvent. Some solvents will be better than others, but even WD-40 or white/methylated spirits (found around the home) may work adequately. Dedicated tar removers are certain to do the job more efficiently, of course, and because all solvents will tend to remove beneficial oils and coatings on the paint, a milder water-based cleaning spray (a general-purpose quick detailer, or a weak APC solution) could be a superior choice after a maintenance wash. Just use a soft cloth, dipped in the tar-removing product, and rub it gently on to the tar spot until it disappears. Flush the area with water afterwards, or spray on some quick detailer to remove the tar-remover residue, and buff to a final finish.

Note that caution will be required with solvents on soft paints or sensitive finishes (for example, certain types of exterior trim): strong solvents can open the pores in older ‘solid’ cellulose paints, allowing contamination to enter the finish (often seen as discoloration). And very strong solvents could even permanently damage, or remove, the paint. If concerned, a gentler approach (such as using quick detailer spray) would be advised.

Petrol and diesel contamination, often seen as runs or streaks near filling caps, can be removed using the same methods as above, although it should be noted that only surface contamination can be removed. If the fuel has softened and damaged the paint, the defect may be much harder to remove or correct.

Insect Remains

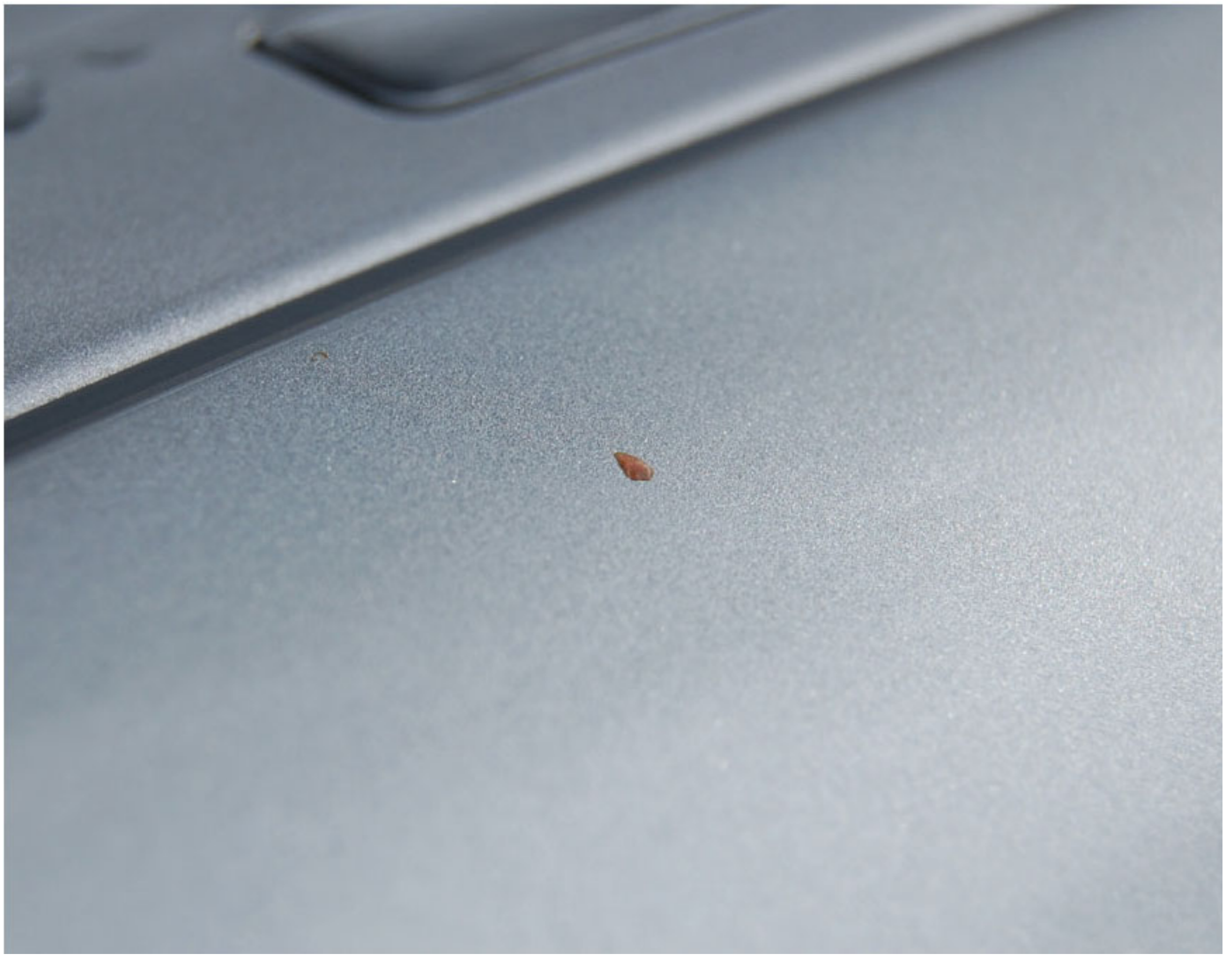
Insect residue is not only unsightly but presents a marring risk, and an insect’s acidic remains may even etch paint if left unchecked.

Insects have hard carcases (meaning a paint marring risk) and sticky acidic residues. If left to ‘cake on’, they can be particularly difficult to remove and could even etch the finish. Of course, by this ‘spot removal' stage, most of the carcase debris will have been removed in the previous pre-wash and wash stages. The remaining residue can be eliminated with either a dedicated bug remover (perhaps containing enzymes), a cleansing quick detailer, APC spray, or even neat shampoo solution (rubbed on to the insect remains with a soft cloth).

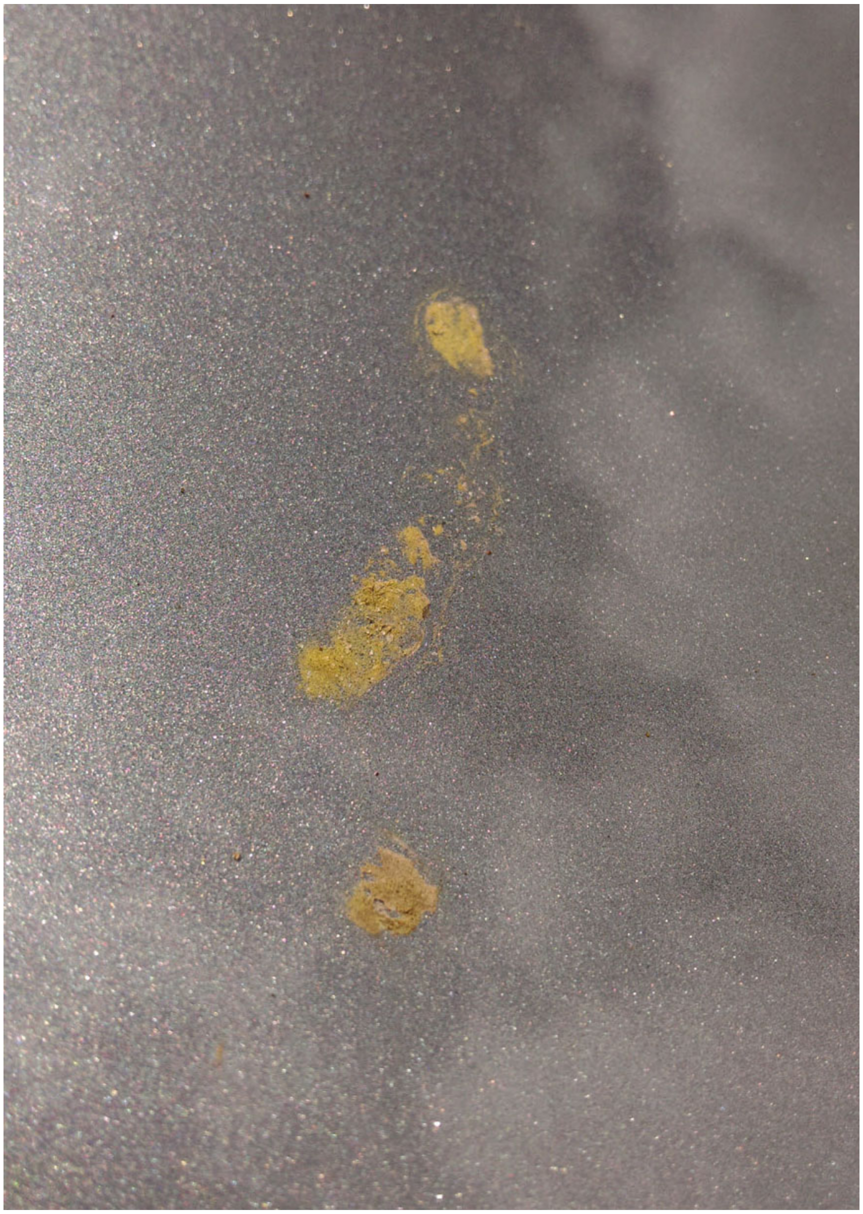
As long as lubrication of the carcase takes place and some cleaning action occurs, the contamination should be safely and successfully removed from the paint surface. If etching has occurred, paint rectification may be required (*see* later in the book).

Tree Sap, Resin and Pollen

Tree sap is sticky and unsightly.



Resin spots are small, hard flecks that stick to paint.

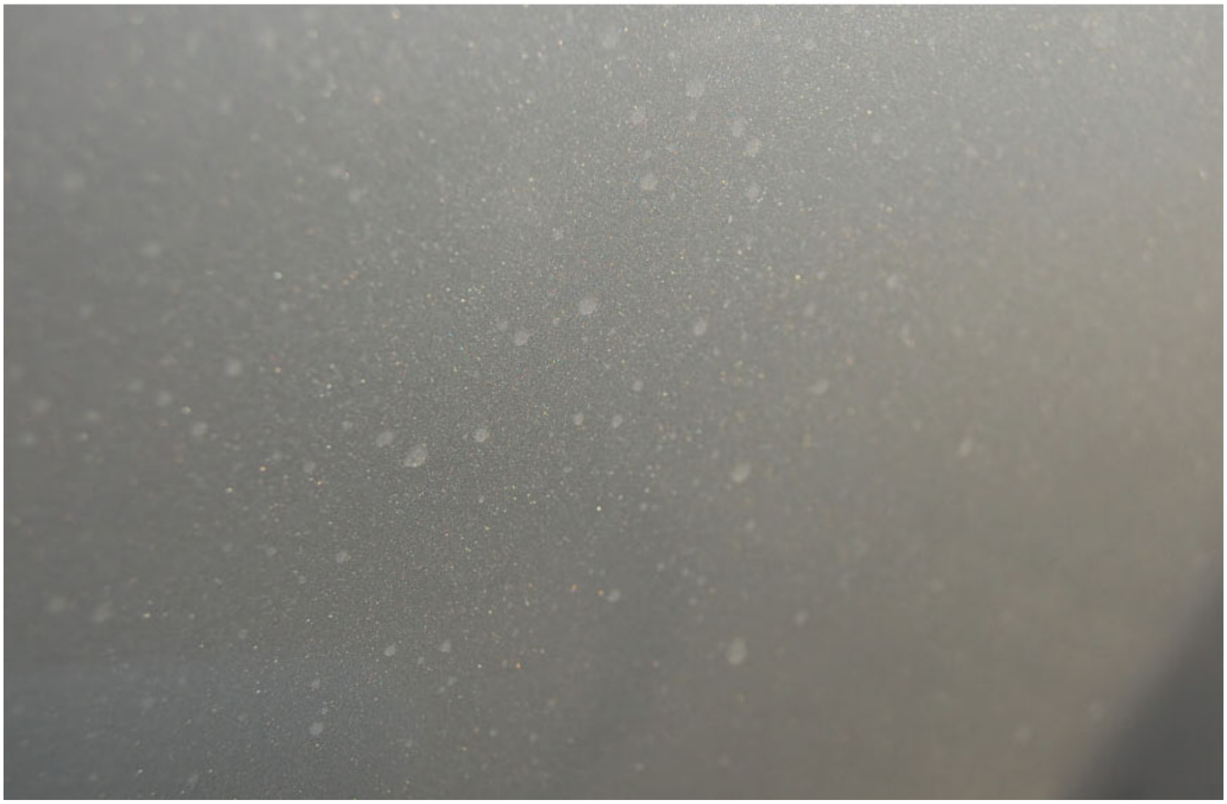


Pollen is typically a dusty, yellow-coloured deposit.

Vehicles parked under trees may suffer from sticky contamination from tree sap and resin: this is particularly stubborn spot contamination and may resist polishing. All-purpose cleaners, quick detailing sprays, tar and glue removers and even clay bars may assist in removal, although it will depend on the age and type of tree sap/resin being removed.

Sap is a sticky, sugary liquid and will be removed by APC, quick detailers, tar and glue removers or even strong soap solutions. Resin is harder in nature and may bond to paint aggressively; a tar remover may soften it, or a clay bar could be employed to remove the flake in its entirety in a pass or two. Pollen is a pale powder in comparison and whilst it can resist washing, stronger cleaners, mild abrasives and clays should remove it with relatively little effort.

Water Marks (Water Spots)



Water marks plague the paintwork of car owners who live in hard-water areas; some types etch deep into the paint and will be difficult to remove.

Water marks may be simple sedimentary deposits from product/dirt residue or the rinse water itself (this is particularly likely if tap water is used for the rinse in a 'hard water' area). If heavy in limescale (calcium carbonate) deposits, they will have an alkaline and abrasive nature, and could even etch into softer finishes if left to dwell. Water marks tend to fall into three categories: surface deposits, embedded deposits and etched defects.

Surface deposits: These are easily removed by abrasion (using clay or drying cloths) and mild cleaning agents (for example quick detailers, neat shampoo and APCs). Limescale surface deposits may also be successfully removed with a mild to moderately acidic solution – an acid wheel cleaner, or even vinegar or lemon juice may suffice. Note, however, that specialist quick detailers will have lubricating properties as well as a good cleaning action, and that this lubrication will be hugely beneficial in terms of preventing marring if hard sediments are being removed. Surface deposits are also more easily removed from previously clayed and protected paint, because the surface itself tends to be far smoother, with fewer ‘anchor points’ for contaminants to latch on to.

Embedded deposit: If a water mark cannot be removed easily, the deposit could be embedded in the paint or clearcoat surface. Typically this occurs after a strong solvent softens a susceptible finish, allowing dirt to enter the opened pores. When the solvent effect wears off, the paint contracts around the contaminants and the deposit becomes embedded. You can tell a deposit is embedded, rather than etched, by feeling it with your fingernail: embedded deposits are raised, whereas etched defects will be sunk into the paint or clearcoat surface. Embedded deposits are more likely with older, solid paints, particularly more sensitive cellulose finishes. To remove an embedded deposit, use a clay bar or stronger cleaning product (an acidic solution may work well with limescale deposits). If that doesn’t work, the paint will have to be wet sanded or machine polished until the defect has been removed.

Etched defect: The problem with water droplets on paint is that they are never 100 per cent pure, plain water. They sit on the surface until moved, removed or evaporated, and can contain all manner of contaminants from cement dust and limescale to tree pollen and volcanic dust. If allowed to evaporate, the relatively weak contaminant mix can become concentrated and have a greater effect on the paint surface than it would do normally. Acidic or alkaline contaminants can therefore etch into the paint, clearcoat or even sealant/wax layer. In the case of volcanic dust fallout (such as experienced in the UK after volcanic eruptions in Iceland), the etching can be many microns deep and easily felt with a fingernail. Removing paint by wet sanding or machine polishing to the depth of these water marks, or even beyond, is the only solution. If the etched defect is in a sealant layer, then removal of the sealant should usually be enough to restore the finish. In any case, etched defects are the most serious form of water marking and the most difficult to correct.

Other Spot Contamination

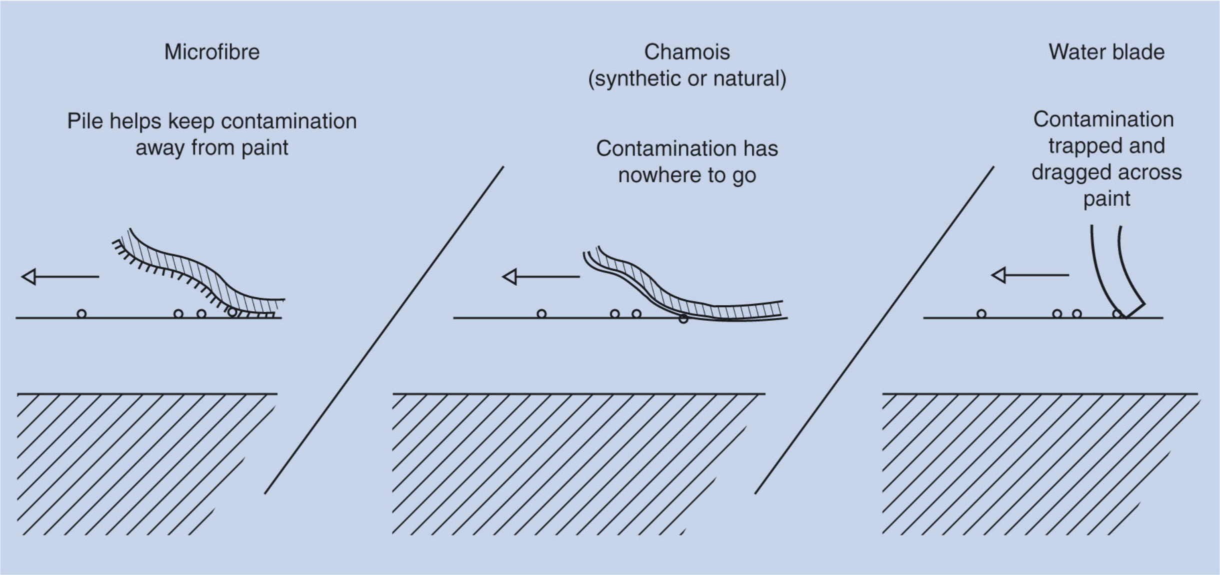
Contamination remaining on the paint at this stage is likely to be ingrained, or will actually be paint damage masquerading as ‘removable’ contamination. If products such as solvents, quick detailer sprays and detergent/caustic/acidic solutions don’t dissolve or remove the contaminant, then the defect will invariably need to be ‘physically’ clayed or polished out – as covered later in this book.

THE DRYING STAGE

'The CD test' – if you can rub the material on a CD without marking it, it is truly soft and therefore unlikely to mar even the softest paints.

Once rinsing is complete and spot contaminants have been removed, it is time to dry the car. Note that if a multitude and variety of spot contaminants were removed, and panel/ambient temperatures are high, the rinsed surface of the car may be dry and water/residue marks may be present. The car should be rinsed once again in this scenario (assuming a rinseless or waterless wash has not been undertaken) and if water spots remain after drying they should be specifically removed in isolation (*see* above). Don't attempt to remove water marks with a drying towel unless using the towel in combination with a drying aid or lubricious quick detailer.

TRADITIONAL CONTACT DRYING


Microfibre
Pile helps keep contamination away from paint
Chamois (synthetic or natural)
Contamination has nowhere to go
Water blade
Contamination trapped and dragged across paint

Microfibre pile versus alternatives.

Good on glass, risky on bodywork: save it for wet sanding, or for the shower screen at home.

Drying after rinsing using a contact technique is always going to present a risk to paint. Whilst the car should (theoretically) be clean at this stage, errant leaves, twigs and bugs floating in the air conspire with crusty chamois leathers and a lazy wash technique to introduce swirl marks and wash marring. To minimize the risk, consider the following points:

Never dry a dirty car: It may seem obvious, but most swirls at the drying stage are caused by drying a dirty car that has been inadequately cleaned. If your drying towel is dirty, your car was not clean and your pre-wash and wash regime could have room for improvement.

Use a soft, absorbent drying towel: Some towels are softer than others. Waffle fabrics can be harsher than may be expected, despite having excellent absorption qualities. If the paint on your car is soft, test the towel on an inconspicuous area first (or test it on a blank CD, as these mark in a similar way to soft paint) – and remove any labels or tags (due to the marring risk).

Pile means protection: Pile in drying towels gives dirt an escape route (as well as a hiding place!), and can help keep contamination away from the paint surface, should any dirt particles remain after the wash stage. Pile is a safety net, in drying terms. This is one reason why chamois leathers are not as popular as they used to be, as the pile depth is non-existent compared to modern microfibre materials.

If using a chamois, ensure it is soaked and supple: Hard, crusty, half-soaked chamois leathers can scratch paint. Soak it for at least five minutes before you start the drying process, in clean, warm water. And don't use it if it is dirty.

Never use a water blade on paint: Whilst good on glass, water blades should never be used on bodywork in general drying scenarios, because if they catch a single grain of dirt, they will drag it over the paint surface – there is no escape route for the dirt particle. In short, they are efficient, but risky to use.

Pat rather than wipe: Consider a patting (or 'dabbing') technique, rather than wiping the drying towel over the surface: this means less chance of dragging contaminants across the paint.

Fold drying towels: Folding towels not only makes them more manageable, but it can also increase absorption by helping the towel to wick water sat on a panel. And if one towel becomes saturated, wring it out or find a dry replacement. Spreading water over a panel with a wet drying cloth is highly counterproductive.

Drying aids lubricate dirt during contact drying, helping guard against swirl marks.

Use a drying aid or quick detailer: Lubricate the panel being dried with a water-based drying aid or quick detail spray. Any dirt particles that do remain will be lubricated and are therefore less likely to scratch the paint surface. These products will also help remove water marks, should any have appeared on the paint surface between rinsing and drying.

Clean towels after every use: Never use a soiled towel, or one that has been dropped on the floor. Remember to inspect the drying towel regularly throughout the drying process, checking it for debris that may have been inadvertently picked up by the cloth.

THE DRYING PROCESS

The drying process itself is quite simple. You will need the following:

- A drying towel or towels (preferably made from soft microfibre with a medium pile)
- A drying aid or quick detail spray (waterbased)

Four-Step Method

1. Re-rinse the car if the wash residue has dried (perhaps due to an extended time removing spot contamination); re-rinsing also helps ensure that the panels are cool. Remember to open fuel-filler cap covers, or blow air into panel gaps and wing mirror housings using a leaf blower, to release trapped water that may otherwise trickle out later.
2. Starting from the top and working down, spray drying aid or quick detailer on to the car, a panel at a time, and then dry the panel thoroughly using a soft, absorbent cloth.
3. Pat or wipe the panel until it is completely free from water, turning the cloth if necessary; wring out the cloth when it becomes sodden and inspect it regularly for contamination, or use a second or third drying towel if the original is too wet.
4. If water spots remain on the panel, apply more drying aid or quick detailer to the affected area with a soft cloth. Should the spots persist they are likely to be more stubborn, perhaps even embedded or etched into the paint, and will require a more robust removal technique, such as claying or polishing.

Note that a 0ppm rinse (*see* above) may mean there is no need for contact drying at all. It is also possible to dry the car using a contactless technique using hot, compressed or blown air. These methods can completely eliminate the prospect of swirls during the drying process.

CONTACTLESS DRYING

Contactless drying is a good way to avoid swirl marks, but can be far slower than contact drying with a microfibre towel.

Contactless drying is of particular interest if you have decided on a contactless maintenance pre-wash/wash, because it then completes the contactless cycle: no contact takes place at any stage, protecting your paint from any chance of marring. Typically, it involves the use of an air blower to blast standing water from the surface of the car before it has a chance to dry, and therefore cause water spotting. Commonly, leaf blowers are used, but dedicated hot-air drying machines are available, and compressed air guns have been favoured by the motor trade for many years because they can blow water and dust out of panel gaps (note, however, that the small nozzle makes drying a whole car time-consuming).

You will need the following:

- A drying machine, leaf blower or compressed air line

Four Step Method

1. Re-rinse the car if the wash residue has dried (perhaps due to an extended time removing spot contamination); re-rinsing also helps ensure that the panels are cool.
2. Set the air blower to a reasonable output – and the temperature if this feature is available – and blow standing water out of all the panel gaps, being particularly careful not to kick up dirt or debris when attending to the lower parts of the car.
3. Blow water off the panels, working from the front of the car to the back, replicating the natural airflow over the car. You will find it easier if the car has only a little standing water on it – if it has been rinsed with an open hose – and if it has been freshly waxed/sealed, so the water slides off the paint effortlessly. Be careful not to touch the paint with the end of the drying machine, and if using a hot-air drier, be cautious around vinyl stickers as the hot air may melt the adhesive and start to peel them, or even cause them to shrivel.
4. Check for water spots caused by evaporation – this is more of an issue with hot-air blowers – and remove as necessary.

After the washing and rinsing stages, paint can be clayed to remove embedded contamination, and then polishing can be explored (including cutting back the paint to reveal a new, uncontaminated and swirl-free finish). Because polishing is arguably more of a gloss-enhancing process and physically interferes with the paint surface, claying could be considered the end of the cleansing regime. If extensive machine polishing or wet sanding (cutting paint) takes place, these steps would be classed as paint restoration. Claying is covered below, and paint restoration is examined later in the book.

FINAL DECONTAMINATION

Claying is a classic detailing process and can remove a wide range of embedded contaminants; even glass can be clayed.

To many, the paint is ‘clean’ after the pre-wash and wash processes. After all, decontamination products such as iron ‘fallout’ removers may have been used, so what use could there be for a clay bar? The simple fact is that fallout removers are not 100 per cent effective, despite their potency; they may leave the tails of iron shards embedded in the paint even when the head has been dissolved. Sometimes the mildly exothermic reaction of fallout removers may be too harsh for sensitive paints, making a clay bar more suitable. And if the prior decontamination processes have been successful, the clay will barely become soiled anyway – so why not make sure? You’ll never use more clay than you need, and the ‘sandwich-bag test’ (where the paint surface is felt to be rough or smooth through a thin plastic sandwich bag) may be fallible – contaminated but heavily lubricated paint can still feel smooth to the touch, and it should not therefore be considered a reliable indicator of whether or not you need to clay.

Clays also work differently from other decontamination products, and suck/shear a wider range of contaminants from the surface than fallout removers and solvents can achieve in isolation, so they should always be used unless there is a compelling reason not to do so (for example, marring of a soft paint finish).

Be wary of ‘clay substitute’ products such as liquid polishes, which promise to do the same job as clay with less effort – whilst they may work to a certain degree, they will not suck/shear contaminants out of paint, especially if it is porous (due to UV degradation, for example).

Conversely, would there be an advantage in going ‘straight to clay’ and missing out the tar and iron removal steps? Whilst this route is theoretically possible since clay will remove tar and iron reasonably successfully, it is really only recommended if there is a compelling reason to avoid the use of harsh chemicals at prior stages – perhaps because of the risk of damage to sensitive paint finishes, or the possibility of a polluting run-off. In all other cases, it makes sense to decontaminate before claying. The clay bar will have less work to do and will remain cleaner for longer if contaminants have been removed previously. This means it is less likely to mar the paint – an ever-present danger when a clay bar becomes soiled during the claying process – and will be in service for longer (thus resulting in an economic benefit).

Note that all tar and glue removers need to be fully rinsed from the surface of the paint before claying begins, as solvents and degreasers will attempt to dissolve clay bars and will make them ‘sticky’. Thus always rinse thoroughly before claying.

STANDARD FINAL DECONTAMINATION WITH CLAY

Polymedia pads and mitts decontaminate paint in a similar way to clay, using a rubberized coating; they may be less pliable than clay, though, and need regular rinsing to keep contamination away from the paint surface.

You will need the following:

- Clay bar or decontamination pad/mitt (‘clay mitt’)
- Clay lubricant

Twelve-Step Method

Roll the clay into a ball, then flatten it to create a small pad.

When the clay is folded, contaminants are trapped inside, keeping them away from the paint surface.

1. Leave the car wet after the rinse stage; if any standing water has dried, re-wet the panel. Water acts as an additional lubricant and keeps the panel temperature down, and it is important never to clay a hot panel because it can cause the clay to melt and drag. A thorough rinse will also ensure that no chemicals are left behind from previous detailing stages; these could interfere with clay bars, which are solvent-based.
2. Choose a suitable clay bar or decontamination pad/mitt. You will need to consider the effectiveness of the clay/material versus the potential marring risk. More aggressive clays will remove more contamination, more quickly, but they will have a higher chance of marking the paint (especially if it is soft). Clay marring looks like a mild, dappled clouding of the paint surface (the dappling effect is caused by the minor ‘orange peel’ texture

of most modern paint finishes), but it is generally very easy to machine polish out.

3. Cut off a chunk of clay; it would be odd (and potentially uneconomical) to use the whole bar at a time. A 20–30g piece will suit most users, but there are no fixed rules. It just needs to be small enough to make a flat pad that can be moved by two or three fingers. Take the chunk of clay and roll it into a ball, then flatten it into a round pad.
4. Spray clay lubricant (at the correct dilution) on to a wet panel, and place the clay pad on to the lubricated surface. Using the tips of two or three fingers, gently move the clay over the surface. The pressure should be enough for the clay to make good contact with the surface, but not so hard that movement becomes difficult or stilted.
5. Listen and feel for contamination: contaminated surfaces feel gritty and a faint scratching noise will be heard. As the contamination is removed, the clay will move freely and sound ‘smooth’.
6. Check the underside of the pad for excessive contamination. Clay shears, sucks and plucks contaminants from the paint surface, and these particles will become embedded. If allowed to accumulate, they could mar the paint despite the lubrication on the surface. The common assumption is that clay lube is there solely to lubricate the clay, but it is actually used to lubricate the contaminants as well.
7. Fold the clay over once the embedded contamination on the underside becomes too severe. This captures the contamination and presents a clean ‘face’. The pad will now resemble a ‘half moon’ semi-circle shape, and once it is re-flattened, claying can continue. If using a decontamination pad or mitt, rinse it occasionally in a bucket of clean water to keep the pad surface free from contaminants.
8. Keep the panel wet and lubricated, revisiting areas until they feel totally smooth. If the clay becomes contaminated again, fold it over into a quadrant shape (trapping the contaminants once more) and continue.

9. Once a panel is complete, move on to the next one. There is no need to use a new piece of clay, or even fold it over, unless the old piece has become too dirty and contaminated. Note that tar spots and bug debris will quickly soil a clay, so do these areas last if the contamination has not been removed during previous detailing stages (or attend to them with dedicated decontamination products, such as tar remover).
10. It is unlikely that you will be able to fold the clay a third time without the risk of contamination breaking through the folds, so throw it away once the 'quadrant' piece becomes contaminated. Get a new chunk of clay, repeat Step 3, and carry on claying. Note that clay should also be replaced if it is dropped on the ground – it will become terminally contaminated on contact, and should not be used subsequently on paintwork for fear of causing extreme marring.
11. Once all panels are done, rinse off the clay residue with plain water (clay residue will be a mix of clay material, lubricant and contamination).
12. After rinsing, dry the car, using a drying aid or detailing spray if necessary.

Whilst claying is usually ample to decontaminate a car, there may be some circumstances where a more extreme decontamination process may be required, perhaps because a 'nano' sealant is about to be applied or because the car is particularly contaminated. The section below describes the ultimate decontamination process.

COMPREHENSIVE FINAL DECONTAMINATION WITH CLAY, FALLOUT REMOVER, PANELWIPE

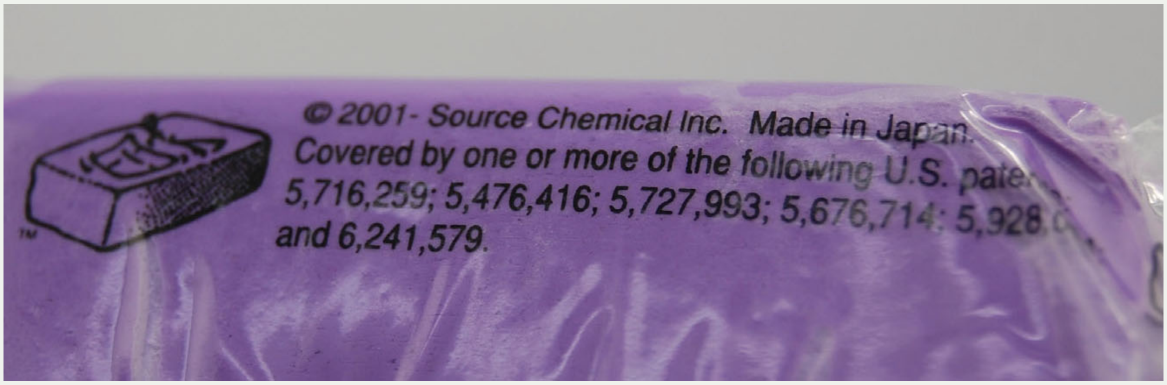
You will need the following:

- Clay bar or decontamination pad/mitt
- Clay lubricant
- Fallout remover
- Panelwipe or strong solvent

Five-Step Method

1. Clay the car, as described above, rinse and dry.
2. Apply fallout remover to the car a panel at a time, starting with the top panels. Check that the panel isn't too hot, as this may cause the fallout remover to flash off too quickly.
3. Any embedded iron particles that remain after claying should dissolve, showing a colour change if relevant. Most iron particles will have been removed by claying, so this process is really just a secondary measure to ensure complete removal of metal contamination.
4. Thoroughly rinse, and then dry, the car.
5. Apply the panelwipe or strong solvent to the car, a panel at a time, with a soft cloth. Do not rub the cloth vigorously over the same spot, in case it inadvertently softens the paint (this is more a danger with old cellulose finishes and SMART repairs than modern clearcoats). Allow the solvent to stand for a few seconds, then remove the residue with a soft microfibre cloth (or cloths).

CLAY: THE FREQUENTLY ASKED QUESTIONS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5,716,259; 5,476,416; 5,727,993; 5,676,714; 5,928
and 6,241,579.
™

A close-up of 'seven patent clay': note the patent numbers.

Shampoo versus water versus soap-based clay lube versus quick detailer: all can be used as clay lube, but which is best?

Clay pads and clay mitts are decontamination polymedia products, rather than traditional 'clay', but they act in a similar way. Just remember to use lube with them, and clean them during and after use.

Are all clay bars the same?

No. The clay bar was initially patented in Japan, but is now made worldwide by a multitude of manufacturers to many different recipes (although the US patent situation does limit the amount of competitive clay bars in the US market). This means that no two clay bars may necessarily be alike. Also, as well as the 'grade' of clay, from super fine to coarse, there may be subtle differences in the consistency of the clay. Some clays are quite rubbery and resist folding, others may be stringy and less robust, and some are powdery or fibrous. Fundamentally they will all do the same job in the same way, but always test the clay you are using on an inconspicuous area of paint if you are not sure about its characteristics; almost any bar of clay will have the potential to mar a painted surface, although it is softer paint that is most at risk.

So what is clay, and what grades are available?

Clay is best described as a poly-abrasive bar. It is a mix of elastomeric polymers and abrasive particles, typically chalk- or clay-like diminishing micro-abrasives. It may appear superficially similar to stationery fixatives such as Blu-Tack, but the higher abrasive content of clay makes it far more suitable for the decontamination of paint. Grades are similar to those of machine-polishing compounds: thus fine grade clay is unlikely to mar the surface but won't remove as much contamination as a coarser clay (which conversely carries a higher marring risk). For most people a fine- to mediumgrade clay is all that will be required. The coarsest clays tend only to be used by bodyshops for overspray removal.

Note that clay marring is generally seen as an acceptable and quantifiable side effect of aggressive clay action; it can be machine polished out quite easily, and should not be feared by those with the right machine-polishing expertise and equipment; it looks a lot worse than it really is. The matt 'mottling' effect is unsightly but usually far from serious.

What other paint damage can occur?

Of more consequence is the creation of RDS (random deep scratches) by inadvertently dragging a grain of contaminant across the paint surface. RDS cannot be removed as easily as clay marring by machine polishing, and therefore need to be avoided at all costs. To minimize the likelihood of this occurring, firstly check the clay face regularly to ensure it is not too contaminated and that no large grains of contaminant are present; and secondly, always use a clay lubricant. Whilst some clay bars are a fine enough grade to be lubricated with tap water, the contamination removed by the clay may be larger and harder than the clay particles themselves. This means that a clay lube should always be used when claying, to ensure that the contamination is lubricated and therefore less likely to 'drag' across the paint surface.

What types of clay lube are available?

Clay lube itself comes in two general types: soapbased 'shampoo'-style lubes and silicone-based 'quick detailer' sprays. You can make your own clay lube using a shampoo solution mixed at 10× standard 'bucket' concentration, but this is perhaps only worth pursuing if you are using up a cheap shampoo – it can be expensive to use a good shampoo for this purpose.

Dedicated products may be more cost effective, and perform more effectively, too. The benefit of shampoo-style lubes is that they clean the surface as well as lubricating the clay and contaminants, although the detergents may leach solvent from the clay if the exposure is prolonged. Quick detail sprays used for clay lubrication purposes tend to use silicone oil as the lubricant, but there is a potential danger of the silicone oil saturating the clay and possibly inhibiting its shearing/abrasion abilities.

Finally, never use a solvent-based spray sealant, detailer or tar and glue remover as a clay lube as it will start to dissolve the clay, causing it to smear across the paint panel, thus rendering it ineffective and causing a mess that will have to be cleaned up afterwards using a strong solvent.

How do you store clay after use?

Clay should be kept in a closed container to prevent it becoming contaminated or drying out. The container does not need to be airtight, though this could be beneficial as it would prevent any possible solvent loss from the clay. The main point is that clay should not be stored immersed in clay lube, as some internet commentators suggest; this could cause the clay to disintegrate due to the solvents being leached out of the clay by any detergents in the clay lube, or cause the clay to dissolve into the clay lube itself.

What are the alternatives to clay?

Some polishing liquids may claim to be 'liquid clay' or 'clay in a bottle', but these will not have the same characteristics as a proper clay bar, being unable to shear and pluck contaminants from the paint surface. Genuine alternatives include decontamination pads/blocks and mitts, either solid bars of plasticized media, or foam/material covered in a rubberized coating that abrades and decontaminates paint in a similar way to clay. These kinds of coating may also be found on velcro-backed discs (suitable for use with machine polishers) and even large microfibre cloths. Strictly, they are not ‘clay’ and do not behave in the same way as clay, but they do decontaminate paint and have the same, or similar, end result. In some respects they may be even easier to use than clay, and are also more reusable (and therefore economical) if the contaminants can be removed from the decontamination ‘face’ (something that is all but impossible with clay, although you may be able to remove larger particles of debris individually from clay, mid-use – sharp fingernails or tweezers could prove useful here).

How often should you clay?

There are two theories regarding the frequency of claying. The first is that you should clay every time you put a fresh layer of wax or sealant on the car (as part of the pre-wax ‘prep’), however frequently or infrequently that is. The idea here is that claying will deeply cleanse the paint and remove any old wax or sealant left on the surface; this is particularly important with wax, which is a sacrificial layer of protection and therefore absorbs dirt and contaminants.

The second theory claims that claying is only necessary when the level of contamination dictates it. Therefore garaged cars that live in rural areas and rarely get driven may need claying once every couple of years, but a car kept outside in a built-up area next to a railway line or steel works would need regular attention. The downside of this is that your car may need claying every three months, but your wax or sealant could last for four to six months before reapplication – but as this will be prematurely removed by the claying process, waxing/sealing intervals are therefore decreased, adding to the detailer’s workload.

This book is of the opinion that the first theory is correct, and that old waxes or sealants (or at least any contamination embedded into them) should be removed before a fresh layer of wax or sealant is applied. Also there is no real danger of 'over-claying' if shorter lifespan LSPs ('last stage products') are used, because claying does little harm to paintwork when carried out correctly.

Does clay remove wax or sealant?

As mentioned above, clay can remove deteriorated wax or sealant before the application of a fresh coating. Aggressive clays may even remove fresh, durable wax or sealant coatings, but this does depend on the type of wax/sealant and its application. Less durable waxes may be removed with finegrade clays, whereas highly durable sealants may resist medium- to heavy-cut clays. Overall it is best to assume that clay will always affect an LSP, and the recommendation is that you should never clay a panel without reapplying protection afterwards.

Can I clay vinyls or plastic trim?

No, there is a high risk of marring – even fine-grade clay may scratch vinyls or plastic trim. And textured plastic trim should never be clayed.

Do you have to clay a new car?

Yes. Whilst less contaminated than 'daily drivers' on the whole, even new vehicles will require claying. Transport film/wrap is removed before delivery, allowing contamination to settle on the paintwork, and some vehicles may have sat outside manufacturing plants, docks or dealerships for months before meeting their new owners. And remember, claying with a fine-grade clay rarely does harm, only good, and you'll only use as much clay as you need to (it won't get dirty if the car is uncontaminated).

How long does clay last?

Clay could last for years, but in reality it needs to be thrown away when it gets too contaminated or becomes inelastic. Whilst it can be folded two or three times when it picks up contamination during use, any further attempts to extend the useful life of clay in this way will most likely be met with the possibility of dirt breaking through the folds and posing a marring risk. The beauty of clay is that you only use as much as you need to. If the car is clean, the clay won't need folding until the next panel, or maybe until far later. This makes claying particularly economical. You don't use a set amount of clay per car, you use a certain amount of clay for the contamination that's actually present.

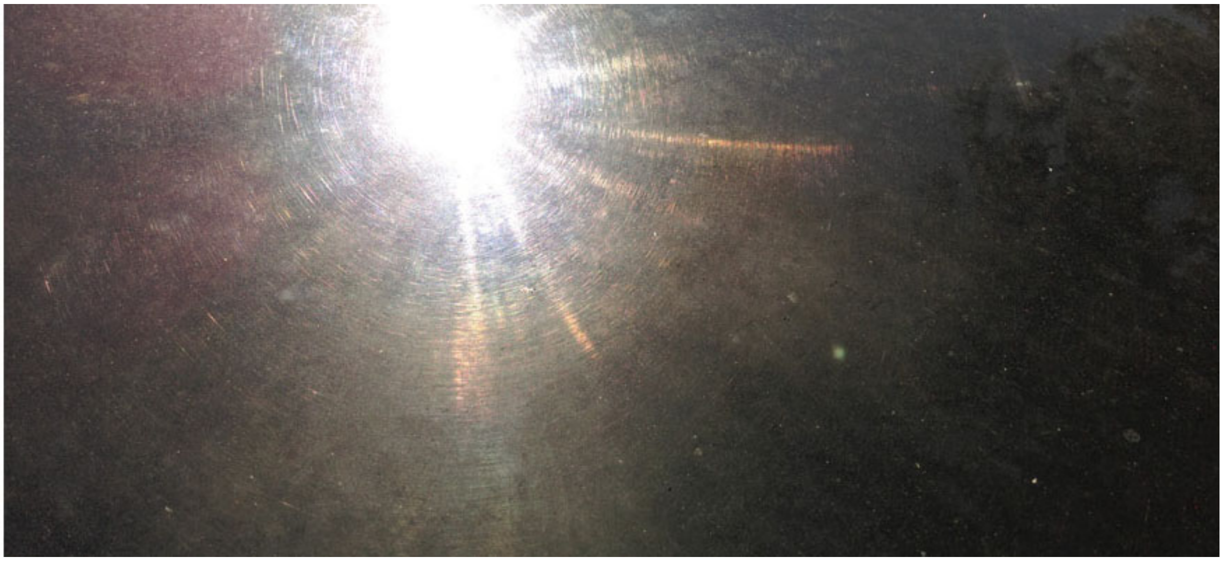
Can you clay more than just the bodywork?

Almost all exterior surfaces, apart from plastic trim, convertible fabric hoods and tyres, can be clayed. Wheels, windscreen and side glass may all respond well to claying. Do not clay vinyl stickers or other sensitive finishes, though, due to the severe risk of marring/damage.

Does clay remove every contaminant?

Even aggressive clays may struggle to remove contaminants if the paint is severely UV damaged, because contamination may have sunk deep into the coating, or anchored into the microscopic pits and fissures found on the surface. In these cases, clay will tend to shear the contamination, leaving the 'tail' of the contaminant behind (this could even start to rust, degrading the finish further); chemical iron removers may successfully remove the tails of embedded metal particles. Stubborn overspray may also fail to be removed by aggressive clay; in this case, a strong solvent such as toluene could potentially be employed, although care needs to be taken as damage may be caused to the surrounding paint. Severe contamination such as superglue residue, weld splats and so on, will also be clay proof. There is a limit to what even the coarsest clays can remove, despite the impressive abilities of clay in general terms.

SURFACE RESTORATION (DEFECT/IMPERFECTION RECTIFICATION)



Swirl marks are a form of sub-surface paint damage, and rob a clean car of its potential beauty by decreasing gloss and scattering reflected light.

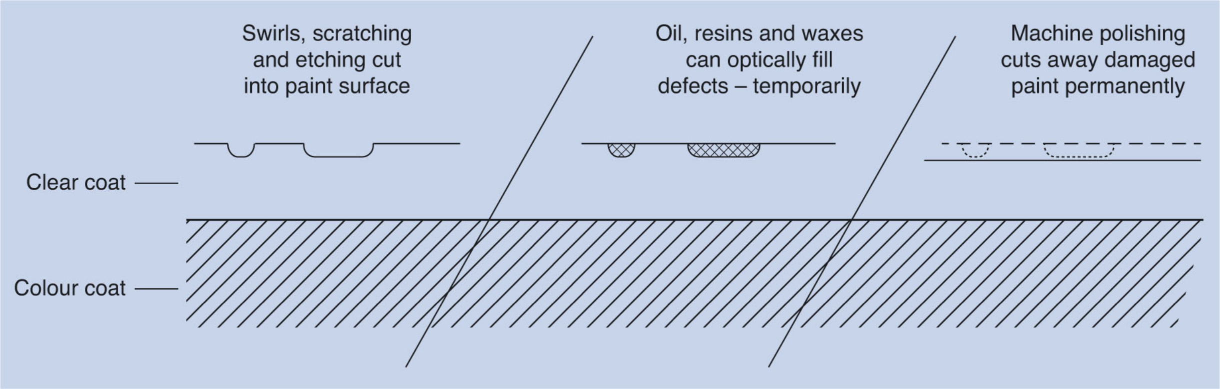
Once the car is clean and decontaminated, it is time to remove defects and imperfections from the surface to create the perfect shine.

A clean car will always look good. You can spend hours ensuring that every inch of the car is cleaned, and protect the finish with a wax or sealant to make it easier to clean in the future. However, there are occasions when the sun comes out and damage to the paintwork that cannot be removed by cleaning becomes more obvious. Hairline scratches, haziness and etching can all serve to rob the paint of its true beauty. This section examines how these ‘sub-surface’ defects can be addressed to allow the finish to be enhanced or perfected (after defects *on* the surface have been tackled).

So what do we mean by ‘sub-surface’? Well, defects such as hairline scratches and wash marring (swirl marks) are described as ‘sub-surface’, because unlike contamination, which is stuck to the surface of the paint, a scratch goes down through the paint’s surface. Techniques such as washing and claying, which deal with contamination sitting on top of the paint, are not suitable for handling these kinds of defect. Techniques are needed that either:

- Remove a small amount of the upper paint layer; or
- Fill in the damage, to create a smooth and optically flawless finish

REMOVING PAINT


Swirls, scratching and etching cut into paint surface
Oil, resins and waxes can optically fill defects – temporarily
Machine polishing cuts away damaged paint permanently
Clear coat
Colour coat

Removal versus filling.

One method of dealing with defects that are in the surface of the paint is to remove a small amount of paint where the damage is to be found. If you can remove a depth of paint that is deeper than the scratches or etching, then you will get down to a ‘fresh’ layer of undamaged paint beneath. The damage is removed – permanently – but remember that you will also be removing an area of ‘good’ paint immediately around the defect. And too much paint removal could cause irreparable damage to the paint surface. The trick is to remove only as much paint as you need to, and never to tackle defects that are too deep; a test patch on a less conspicuous area will always be prudent practice.

FILLING THE DAMAGE

An alternative to removing paint is to fill or mask the damage, a bit like plugging a crack in the wall with a cement-like filler. This method does not remove any paint, but still seeks to achieve a level surface

– and therefore create perfect light refraction and reflection. Contrary to the permanent solution of removing paint, filling the damage is a temporary fix. However, it is also a ‘non-destructive’ fix as you do not remove any paint in this process. Note that these optical ‘fillers’ include a wide range of oils, resins, sealants and waxes. Most polishes, waxes and sealants – and even shampoos – may have filling attributes. On imperfect paint, any filling or masking of the finish will be beneficial. But for the detailer seeking permanent and perfect surface rectification, the action of filling ingredients may prove frustrating and counter-productive.

RECTIFYING THE FINISH BY PAINT REMOVAL

A car’s paint finish is just like our skin – exposed to, and weathered by, the elements (day and night, if the car is ungaraged). These elements take their toll on a car’s appearance, detracting from the finish. Ultraviolet radiation from the sun is one of the culprits, causing paint fade (the most obvious example being a solid red paint turning pink over time), but there are many others. Rain can contain acidic or caustic contaminants, bird mess etches paint deeply if left unattended, and dirt itself is nature’s very own grinding paste, scratching the relatively delicate surface at any available opportunity. In addition to these elements are a multitude of man-made hazards: caustic traffic film removers that can dull dark finishes, poor wash techniques, jean studs rubbing against the bodywork, parking damage. . . the list goes on. (The different types of defect are covered comprehensively earlier in this chapter.)

Ideally, these defects are removed permanently by shaving off a microscopic sliver of paint, until a layer of fresh and undamaged paint is exposed underneath. However, this is not as easy as it seems, due to the large number of variables involved.

GENERAL VARIABLES AFFECTING CUT (RATE OF PAINT REMOVAL)

Products and equipment need to be chosen carefully to elicit the correct amount of paint remover, and both are investigated in more detail below. But they account for just some of the variables encountered. It is important to consider all the factors that affect cut before undertaking any corrective process.

Paint Type and Hardness

This red 'paint' finish could be a single-stage red without a clearcoat, a clearcoated red, or even red gel coat. It is difficult for the uninitiated to recognize a particular finish, let alone enhance or correct it.

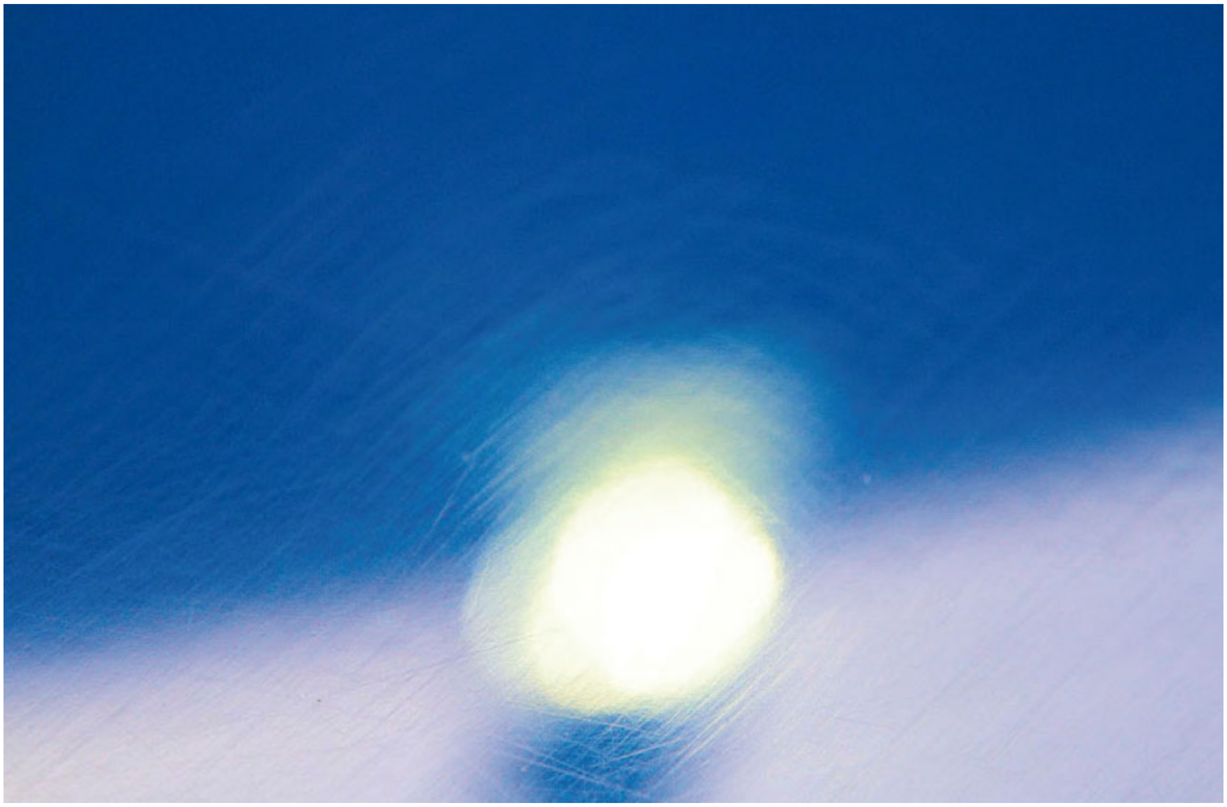
Like cars, paints will come in many different forms from many different manufacturers. Different chemical constituents in the paint (especially 'low solids' versus 'high solids' pigment content) will lead to differences in hardness and flexibility, differences in spraying will mean that paint thicknesses will vary, and even the same model car from the same manufacturer may have different paints on different parts (for example, more flexible paint on flexible components such as front bumpers). To add to the confusion, the same car type may have entirely different paint if it is manufactured in a different plant, elsewhere in the world. And this is just the original manufacturer's paint – if the car has been resprayed or SMART repaired, then the paint characteristics become even more enigmatic.

This means that paint type and hardness should never be taken for granted, and they need to be assessed on an immediate and individual basis. Remember that some surfaces that look like paint may not even *be* paint – gel coat, for example, a colour-impregnated resin used to finish a GRP (glassreinforced plastic) surface, may look like paint and behave like it to a certain degree, but technically the material is somewhat different to a modern clearcoat.

The main variable of polishing is arguably the hardness of the paint. Not only is there going to be a range of hardnesses between different vehicles and paint types (old cellulose finishes are going to be softer than modern ceramic clearcoats), but the exposure of that paint to the elements will also lead to differences in hardness. An old, brittle paint finish could correct in an entirely different way to a fresh coat (the brittle top layer may be softer than the less-weathered layers below). And this isn't the only scenario where paint is inconsistently hard all the way through: some ceramic clearcoats have a very tough upper 'crust' but are much softer beneath that tough upper layer.

So, the harder a finish is, the greater the effort required to remove a given thickness of paint. With a soft paint it will require little effort to remove a couple of microns of paint, whilst a hard paint will require significant effort for the same amount of cut. In other words, when it comes to removing surface defects – such as scratches that are a certain depth into the finish – the harder the paint is, the more difficult it will be to remove those scratches.

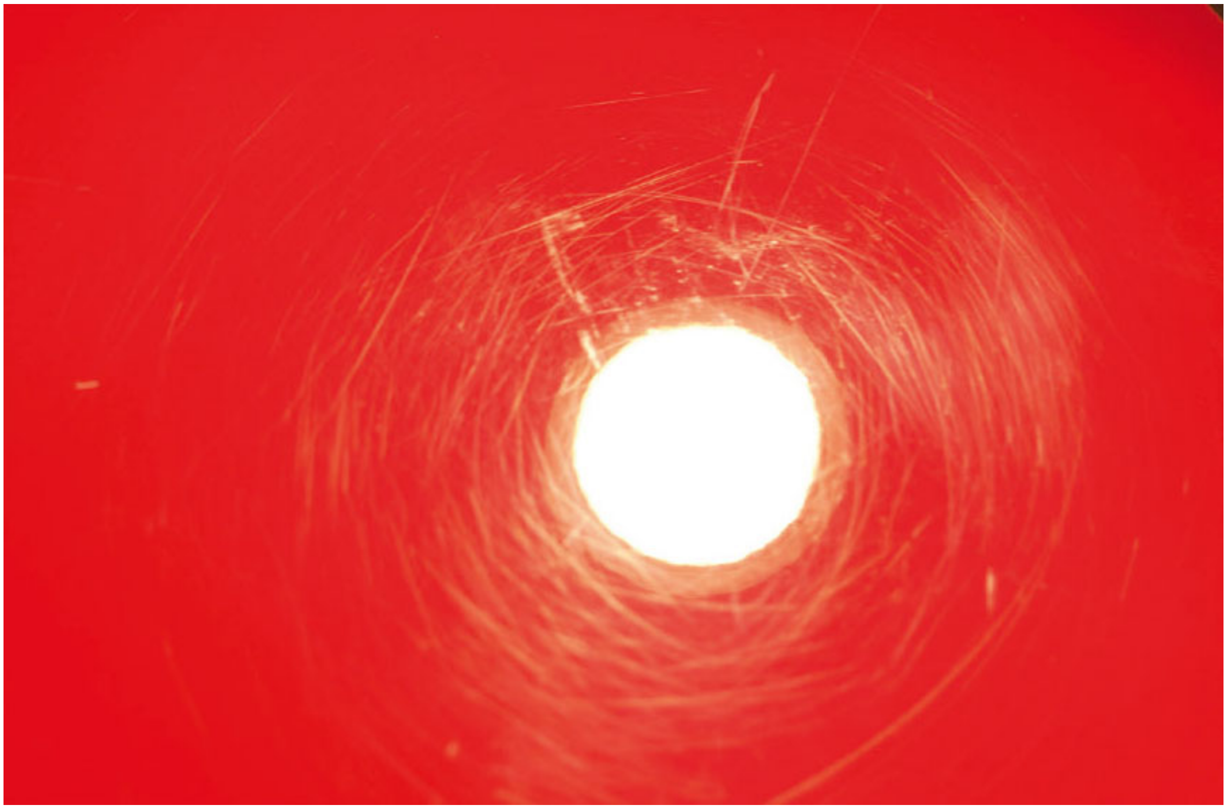
The best way to ascertain the hardness of a paint finish is to polish it and measure the amount of paint that has been removed. With many variables affecting paint hardness, it is bad practice to assume the hardness or softness of the finish based on the badge that is on the bonnet. That said, there is no harm knowing the general assumptions, as they may help as an initial guide; German cars such as Audi, VW, Porsche and BMW, tend to have hard paint, whilst Japanese cars such as Subarus, Nissans and Toyotas will generally have soft paint. However, the best way to know for sure whether the paint is hard or not is to polish a small section and see how much paint has been removed. Or more simply, make an estimate based on how easily defects are being removed from the finish.



Swirls in softer paint may appear circular and 'woolly'.

If you need to make a quick assessment of a finish without the aid of polishes or polishing equipment, the type and amount of scratches on the paint surface can be assessed visually, bearing in mind the age and model of the vehicle. This is a very 'rough and ready' gauge and should not be relied upon, but it may help to provide a general indication of paint hardness. Circular, 'fluffy' or 'woolly' swirl marks may hint at paint softness, whereas short, sharp, 'spiky' swirl marks can indicate paint hardness.

Polish Abrasive Level (Polish Cut)



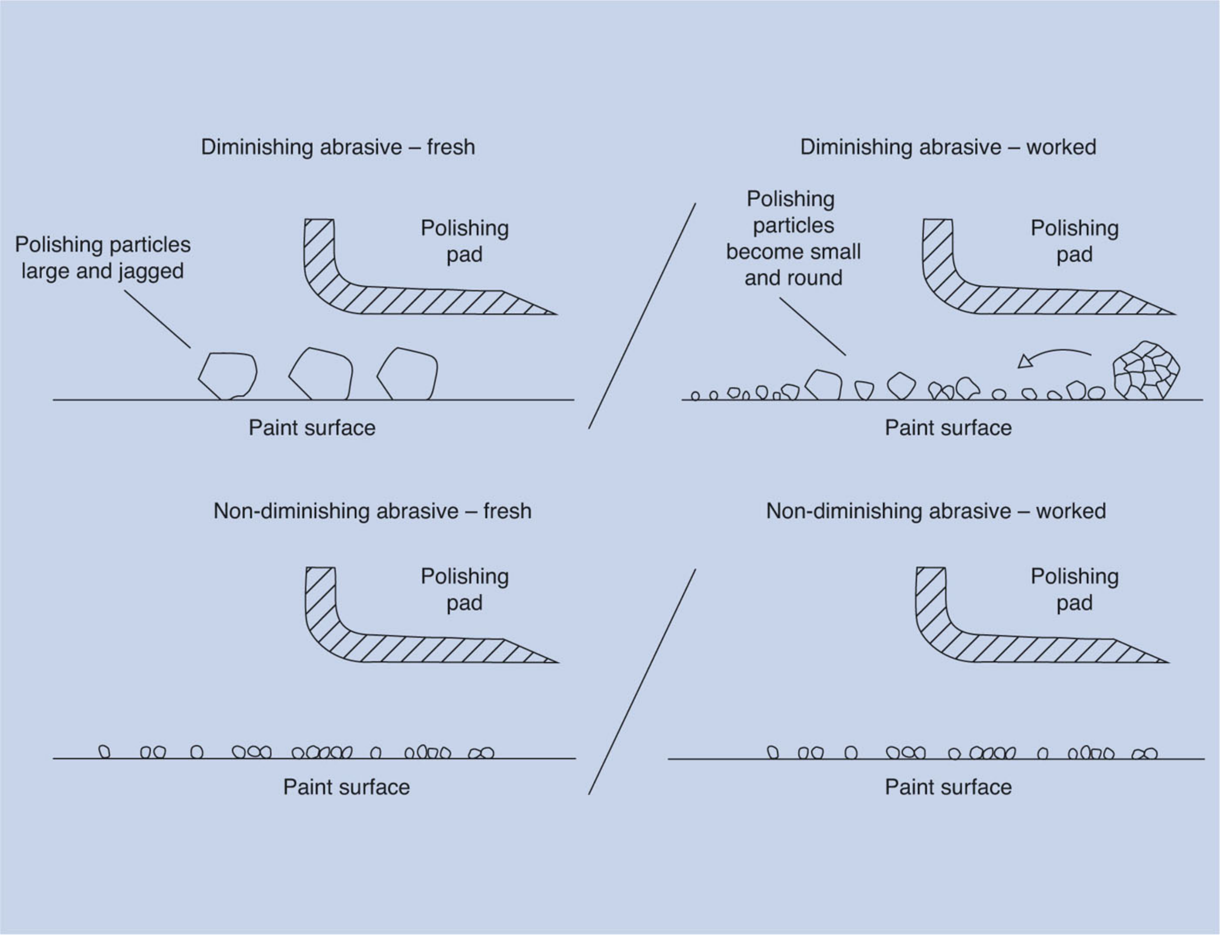
Swirls in harder paint are likely to be shorter and sharper in appearance.

Given the large variety of paint finishes and possible defects that may be encountered, it is not difficult to imagine that there must be a huge range of different polishes. One of the main variables of a polish is the amount of ‘cut’ that it provides – in other words, how much paint the polish can remove with a given polishing technique, or – alternatively – how quickly a polish is capable of removing paint (the higher the cut, the more aggressive the polish and therefore the quicker the paint will be removed).

Care should be taken when using aggressive, heavy cut polishes (sometimes known as compounds) because these can remove paint quickly – and this could lead to ‘strike-through’, where the entire layer of paint is removed (usually necessitating a respray). Note that whilst manufacturers will often give a guide to cut on the label of a polish, it should not be wholly relied upon. Seeing how the abrasive works for you, on a real panel, is far more important.

The cut of a polish will be dictated by the polishing particle hardness, the resilience of the polishing particles (diminishing or non-diminishing – diminishing particles become finer and more rounded when they are worked, meaning an ever-decreasing cut), the shape of the polishing abrasives (jagged particles may have more cut, but also an unwanted side effect of more marring), and the lubricants within the polish mixture (higher lubrication increases working time and 'workability', but generally diminishes cut).

Pad Choice


Diminishing abrasive – fresh
Polishing particles large and jagged
Polishing pad
Paint surface
Diminishing abrasive – worked
Polishing particles become small and round
Polishing pad
Paint surface
Non-diminishing abrasive – fresh
Polishing pad
Paint surface
Non-diminishing abrasive – worked
Polishing pad
Paint surface

Diminishing versus non-diminishing abrasives.

The pad is often given less importance than the polish type when cut is being assessed, but pad choice can have a very significant effect on the results you achieve. Foam pads, for example, come in both open cell and closed cell structures, in different foam densities and in a range of foam materials, and can therefore offer a range of cuts in the same way that polishes do. Hard foams cut more aggressively, dense foams tend to mar less, making them more suitable for ‘finishing’ (refining) a paint finish, and the cell structure (open or closed) affects the way and rate that polishes are absorbed into the pad, and therefore how they work and how long they work for.

The differences above are particularly useful if using a ‘single-stage’ or ‘one-step’ polish (that is, one that cuts as well as refines) because you can use different pads to alter the level of cut. This effect is more pronounced if using non-diminishing abrasives, as referenced previously.

Polishing Method

The polishing method itself will also have a huge bearing on the results you achieve – most notably the time taken to achieve the results. You can polish either by hand or machine – machine polishing is invariably faster and more consistent – and there is a wide variety of different types of polishing machine available, ranging from gentle clutched orbital machines to aggressive rotary polishers, all with varying power/torque/speed characteristics, and some with the option of dual polishing heads.

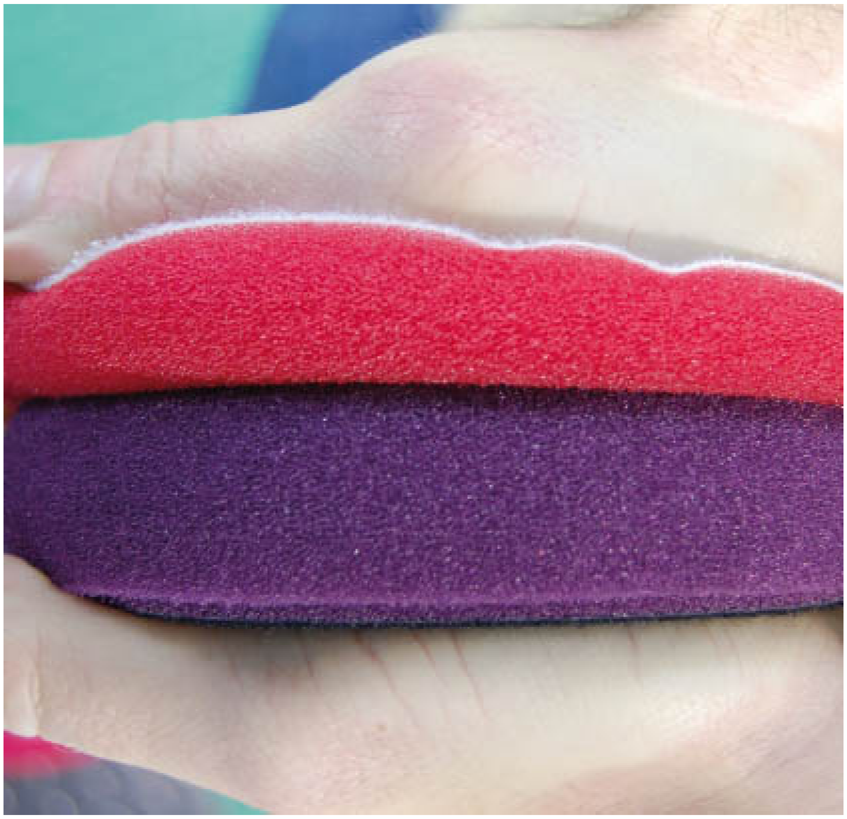
Polishing Pressure

The process of polishing with abrasives is a mechanical one. You are rubbing small abrasive particles against the paintwork to remove a very thin layer of the paint, as if using sandpaper on wood, and the greater the pressure you apply, the more the abrasives are going to bite into the paint. Therefore pressure is a key variable in the polishing process, especially when increased pressure means more friction and higher panel temperatures – paint will generally cut more quickly and easily when it is hotter and more ‘fluid’. Pressure is important with diminishing abrasives for breaking them down successfully (and therefore reducing marring), and critical for adjusting the overall amount of cut achieved with non-diminishing abrasives.

HOW DOES YOUR POLISH SHAPE UP?

There are many polishing compounds available on the market but they vary in how they cut, as well as in terms of how much they cut (diminishing versus non-diminishing abrasives).

The shape of the abrasives in a polish is often overlooked, but their shape can affect cut. For example, some abrasive particles are very sharp and brittle and cut quickly, but then fade. Others are hexagonal in shape, which means that they cut more slowly but the cut is longer lived. It is not possible to know the shape of the abrasive used just by looking at the label, but you will soon find out how the abrasive performs when you use the polish. If it seems to cut quickly and then fade away, then it is a sharper, more brittle abrasive. If it cuts more slowly and for longer, it is likely to be a hexagonal (or similar shape) abrasive. The shape of polishing abrasives is less critical with non-diminishing abrasives, however. These polishes contain small, hard particles – perhaps spherical ceramic particles that cut aggressively but are less likely to induce marring – that do not break down and the cut remains consistent during all stages of the polishing process.



Quickly assess the firmness (and therefore potential cut) of two foam pads by pressing them together: the softer pad will give way to the firmer pad and squash more.

Polishing Technique

The speed and angle of a machine polishing pad are dictated by the user, and the way you use a machine polisher or work by hand will also have a significant effect on the results you achieve. This is discussed in greater detail below, but always bear in mind the input of you, the detailer: the cut is never just down to the machine, pad and polish (in a similar way, two fishermen with identical rods and bait may have differing levels of success on the same stretch of river). Interestingly, this variable creates a lot of confusion online, as one detailer may experience one outcome on a certain paint type with a specified pad/polish combination, and another detailer using the same combination may experience a substantially different result. Technique could be the simple reason for the discrepancy.

Set Size/Area

A polishing ‘set’ consists of a number of polishing passes over a given area. The size of that polishing area will affect both the amount of cut you will achieve, how quickly you achieve it, and possibly even the clarity of the finish. Working larger areas means that you do not focus your efforts as intently, and the overall cut will be lower. Also, there is the risk of the polish drying out before the abrasives have been fully worked, cutting the set length short and reducing the clarity that you could potentially achieve in terms of the finish. If you are experiencing poor refinement or failing to achieve enough cut, always consider reducing the size of your sets and concentrating your attention on a smaller area.

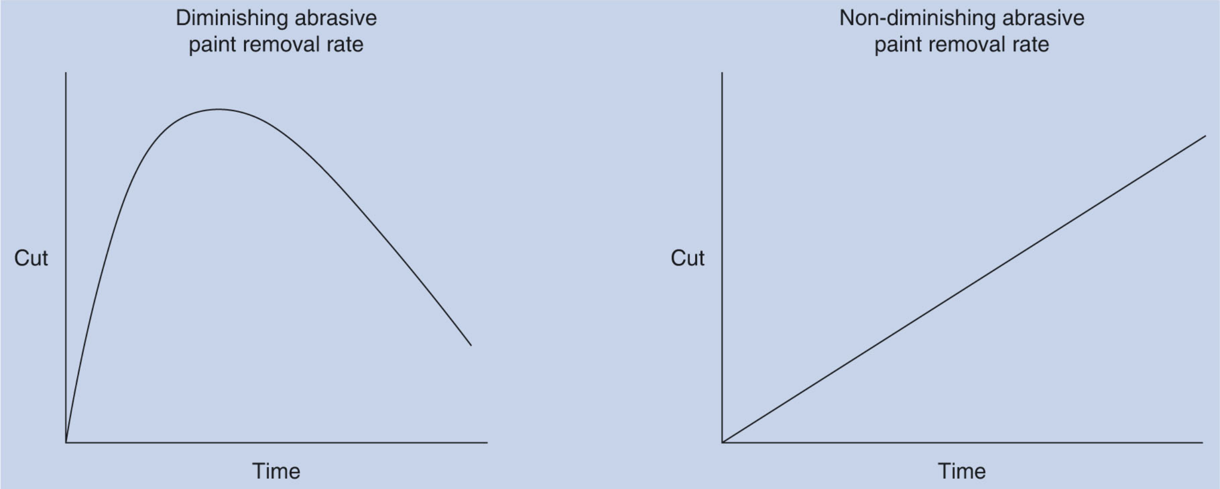
Set Length and Number of Sets

The abrasives in diminishing polishes will break down systematically and require a certain amount of working to deliver their full performance. The set length (number of passes per set) is an important variable, because if it is too short, you will not achieve the best clarity of finish nor the level of cut that the product is capable of achieving. ‘Long’ sets with a large number of passes will tend to remove more paint than short sets, although the amount of cut will level off with diminishing abrasives, with the highest levels of cut being achieved early on, and the later passes delivering little cut but refining the finish. If using non-diminishing abrasives, be very careful of polishing in long sets – shorter sets will mean a better chance of avoiding accidental strike-through. However, if you are refining or ‘finishing down’ paint, then longer sets with gentle pads and polishes will usually deliver the greatest possible clarity. The number of sets also contributes directly to the amount of cut exacted on a panel. One or two sets will (obviously) have a limited effect compared to three, four, five or more.

Speed of Passes

Fast, sweeping sets across the panel do little to expose the paintwork to high levels of cut. Abrasives take time to erode the paint surface, and fast sets mean that they have less effect. Slower, considered passes will subject the paint to a more meaningful abrasive action.

PAINT REMOVAL PRODUCTS



Paint removal graphs: diminishing versus non-diminishing.

All-in-one cleaner wax, pre-wax cleanser and cutting compound. . . all are members of the polish family.

As can be seen from the analysis of general paint removal variables above, the polishes employed have a significant influence on overall cut. The term ‘polish’ encompasses (in the modern sense) any abrasive solution or compound, and includes a wide family of products ranging from ‘pure’ polishes (that abrade paint and nothing more) to pre-wax cleansers (polishes with cleaning, and sometimes glazing, agents), ‘all-in-one’ products that clean, polish and protect, and the ominous sounding bodyshop ‘compound’. The cutting compound term historically refers to block or paste abrasives rather than thinner cutting liquids, but as modern polishes tend to have a thick consistency to guard against sling, the name now relates to machine polishes of all types (whether fine, medium or heavy cut).

Polishes previously signified any gloss-enhancing product, so non-abrasive products that chemically cleaned or reacted with the surface, or glossenhancing glazes, would sometimes fall within the same class (this is especially true in the realm of metal finishing). But for simplicity and to avoid confusion, we shall define ‘polish’ according to modern detailing/paint application terms, and treat a polish as being distinctly abrasive in nature (indeed, polishes often have a ‘grit’ number that refers to the type of sanding marks that they can remove).

A 1000-cut compound will be formulated to remove the sanding marks created by rubbing paint down with 1000-grit wet-and-dry paper – in other words, it is a heavy cut compound.

Furthermore, 'polish' is frequently (and erroneously) used to refer to products that protect the finish: 'I've given the car a good polish today.' But this is attributable to the gloss-enhancing abilities of certain protection ingredients and the prevalence of mass-market convenience products that merged multiple car-care stages into a single bottle (for example cleaning, polishing and protecting). If a dedicated non-abrasive wax product has been used, the car will not have been ‘polished’ in the strict detailing sense.

Therefore, the true intent of a polish is to correct the paintwork by physically removing imperfections in the surface, although many polishes contain glazing agents to improve the paint appearance as well (by filling defects to enhance the finish further). Typically, glazes are oils, but sometimes a glaze could be a resin, a natural or synthetic wax, a sealant, or a blend of any of these aforementioned ingredients. The main attributes of a glaze are that firstly, it enhances the visual appearance of a surface, and secondly, it is abrasive free (and therefore *not* a polish in itself).

Glazes are non-abrasive and are therefore not polishes in the strictest sense; the word 'polish' comes from the Latin 'polire' meaning 'to make smooth' – and it is only an abrasive substance that can refine a rough paint finish and physically make it smooth.

Polishes are a blend of carrier (the solution that suspends the polishing media), the polishing media itself (anything from clay/chalk abrasives to metallic or ceramic particles), lubricants (to help the polish 'flow' across the paint surface and reduce the unwelcome side effect of polish marring) and glazing ingredients (to add 'wetness' and gloss to the finish). Some polishes may include additional cleansers and paint protectants, but these are less likely to be used for a dedicated paint removal process. Ignoring features such as cut, glazing ability and lubrication, polishes can be divided into two main types: diminishing and non-diminishing (as has been touched upon previously).

DIMINISHING ABRASIVE POLISHES

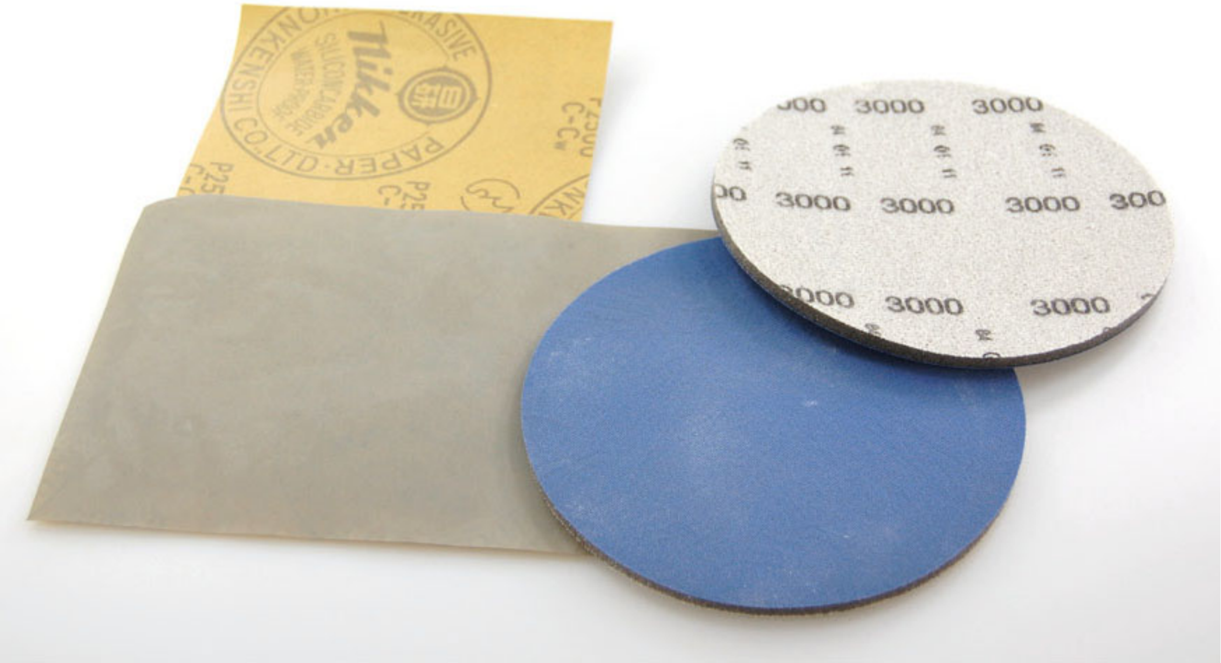
Diminishing abrasives are abrasives that break down as you polish. Because the particles round off or break into smaller pieces, the cut gets less and less as the polishing process progresses. Any marring inadvertently initiated by the early heavy cutting stage can therefore be refined subsequently by the less aggressive later stage abrasives. Note that once the polishing particles have broken down, the cutting action will either cease or remain consistently low. There is no point 'over-working' a tired or depleted diminishing polish once an adequately refined finish has been achieved. It is far better to continue cutting with a fresh measure of polish, or choose a dedicated refining polish or glaze for subsequent finishing.

NON-DIMINISHING ABRASIVE POLISHES

Polishing technology is now adopting abrasives that do not break down. These are known as 'non-diminishing abrasives', or 'constant-cut abrasives', as they remain cutting at the same rate throughout the polishing set. The idea behind them is that firstly, they can cut harder for longer (in comparison to diminishing abrasives), and secondly, you can change the amount of cut by changing the pad or the amount of pressure (or other factors), rather than changing the polish. Naturally, diminishing abrasives can also have their cut varied by changing the pad and polishing process, however non-diminishing polishes take this flexibility to another level with a greater response to the changes in variables mentioned. They may also offer more convenience, in that a single nondiminishing polish could take the place of multiple diminishing abrasives.

A further point to note is that most non-diminishing abrasives are water-based (even those polishes containing oils will be water-based emulsions), and this means that set length can be prolonged with the addition of water during polishing. Because the abrasives do not break down, the user can control the set length and the amount of cut and finishing ability by changing the dilution of the polish, the pressures and the working speeds. This increased flexibility over diminishing abrasives requires greater practice to master, but can be highly rewarding by offering more polishing options from just a single polish.

SANDING PAPERS AND DISCS



Sanding discs deliver more cut than flexible foam pads, but they will mar the paint whilst doing so and the finish will require subsequent refinement.

If a polish isn't cutting the paint adequately, the only recourse is to sanding paper or sanding discs. By laying polishing particles on a rigid backing, cut is maximized because the cushioning has been removed and there is nowhere else for the polishing particles to go: they are forced to act directly on the paint surface. Sanding grades are usually referred to by the ISO grit scale, where 5000- and 4000-grit papers are the finest, 3500-, 3000- and 2500-grit papers have medium cut, and 2000- and 1500-grit papers are heavier and harder cutters of paint. The classification system historically referred to the number of grains of grit on a given area of sandpaper: the more grit particles, the smaller in size and cut they would tend to be. Sanding paper can take the form of discs that attach directly to orbital and rotary machine polishers, and they may be made of a woven or fibrous material rather than the traditional grit-laden sheet. Whatever the form, these sanding materials are normally used wet, for lubrication and to carry off the paint residue (hence the phrase ‘wet sanding’ or ‘wet and dry’ paper).

PAINT REMOVAL EQUIPMENT

As well as the polishing media that act directly against the paint surface, there is a variety of pads, backing plates and machines used to transmit the cut to the panel. All play their part in dictating how much paint will be removed, and how quickly.

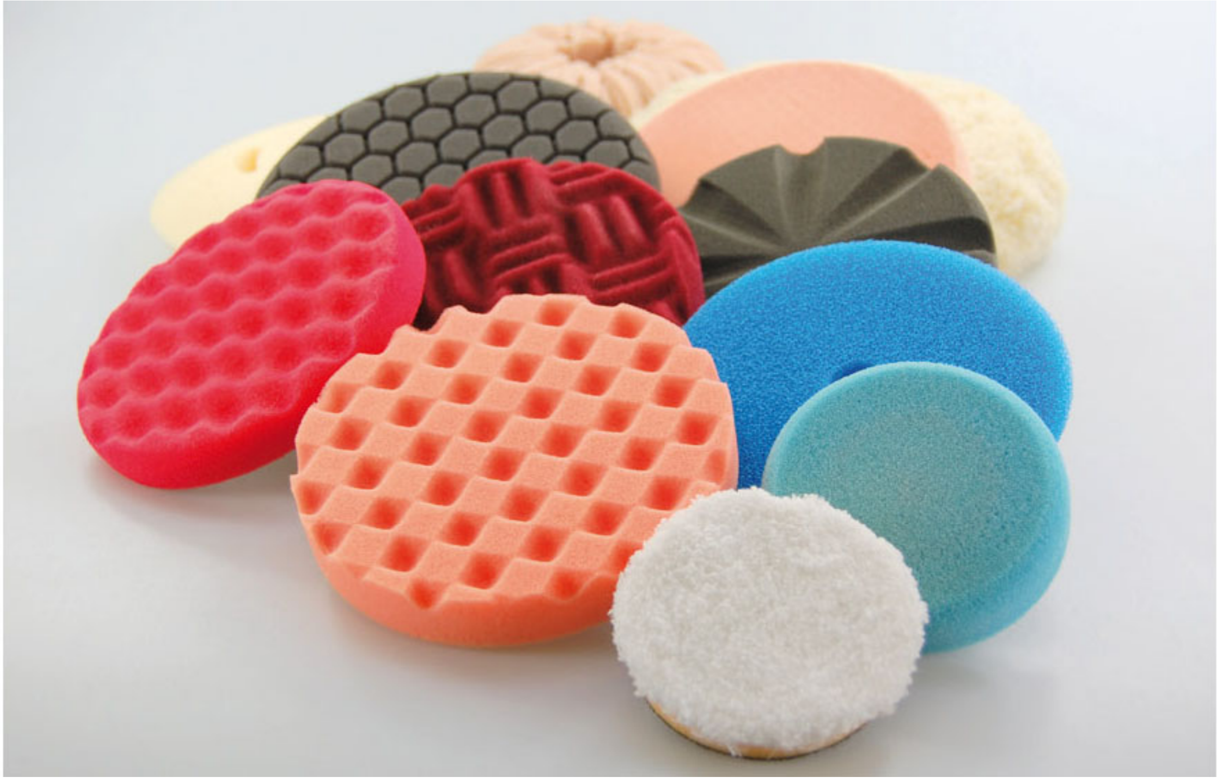
POLISHING PADS

With a massive range of polishes on the market, it is easy to forget about their humble means of application: the polishing pad. Whether working by hand or machine, the pad can have a big effect on your polishing results, magnifying the cut achieved or even negating it. Machine polishing pads can be divided into two main types: foam pads and fibre pads (traditionally wool, but microfibre pads are currently gaining in popularity). Foam pads can then be subdivided into two further categories: open cell and closed cell.

Foam Polishing Pads

Foam pads come in a range of different materials, densities and designs, offering an almost limitless choice of polishing options – some even have ‘grit’ grades that correspond to the size of sanding marks they should be able to remove (for example, a 3000-grit foam should be able to remove sanding marks made by 3000-grit sanding paper). But it’s not all about choosing a fine finishing foam or a heavy cutting pad: the way a pad cuts also needs to be considered.

Let’s take size as an example. One of the main reasons for smaller ‘spot’ sizes of pad is simply to make it easier to tackle confined, compact or uneven areas that are traditionally difficult to polish, such as bumpers, wing mirrors or door pillars. However, the size of the pad also affects the cut that it offers. On a rotary polisher, the bigger the pad, the greater the potential cut, because the outer edge of the pad is moving faster due to a greater radius – so ‘spot’ pads are likely to cut less, despite being made from the same material (although note that heat concentration will also affect cut, and smaller pads may get hotter more quickly). To add to the confusion, the opposite is true for an orbital polisher, where the cut is greater for smaller pads because the work effort is more focused. Larger pads also tend to have longer working times, because it takes them longer to become clogged with polish residue.



Polishing pads differ in size, design, construction and material, and all these elements can affect cut.

As well as the size of the pad, the surface profile of the pad can differ. Traditional pads have a flat face, but some manufacturers offer different pad faces. One example of this is the 'waffle' design that looks a bit like an egg box – in theory, this uneven profile allows for less 'sling' (polish splatter) and greater air-flow at the polishing face, lowering panel temperatures. Other manufacturers use hexagon or slotted designs that consist of a network of small grooves or channels cut into the pad face, like sipes in a tyre. Again, there is a desire for greater airflow and also to help the polish spread more effectively across the pad, or be dispensed or worked in a certain manner. Heavily corrugated ‘blade’ or ‘fin’ designs mean reduced splatter and panel temperatures, but also claim a more consistent cut across a larger pad area.

The benefits of these designs should perhaps not be overstated – there is limited scientific evidence to back up most of the claims, and much rests with the opinions of individual users – but it is worth bearing different pad designs in mind. You may have a variable, such as panel working temperature, that you want to control, and you find a certain pad works well for you: it may simply come down to ‘feel’ or personal preference. One pad may ‘drag’ across the panel more than another, or ‘stutter’ in use, and another may not.

Tall pads may run cooler, limiting cut but ensuring good contact with the paint surface. Shallow pads tend to run hotter and cut harder, but could be less forgiving in use.

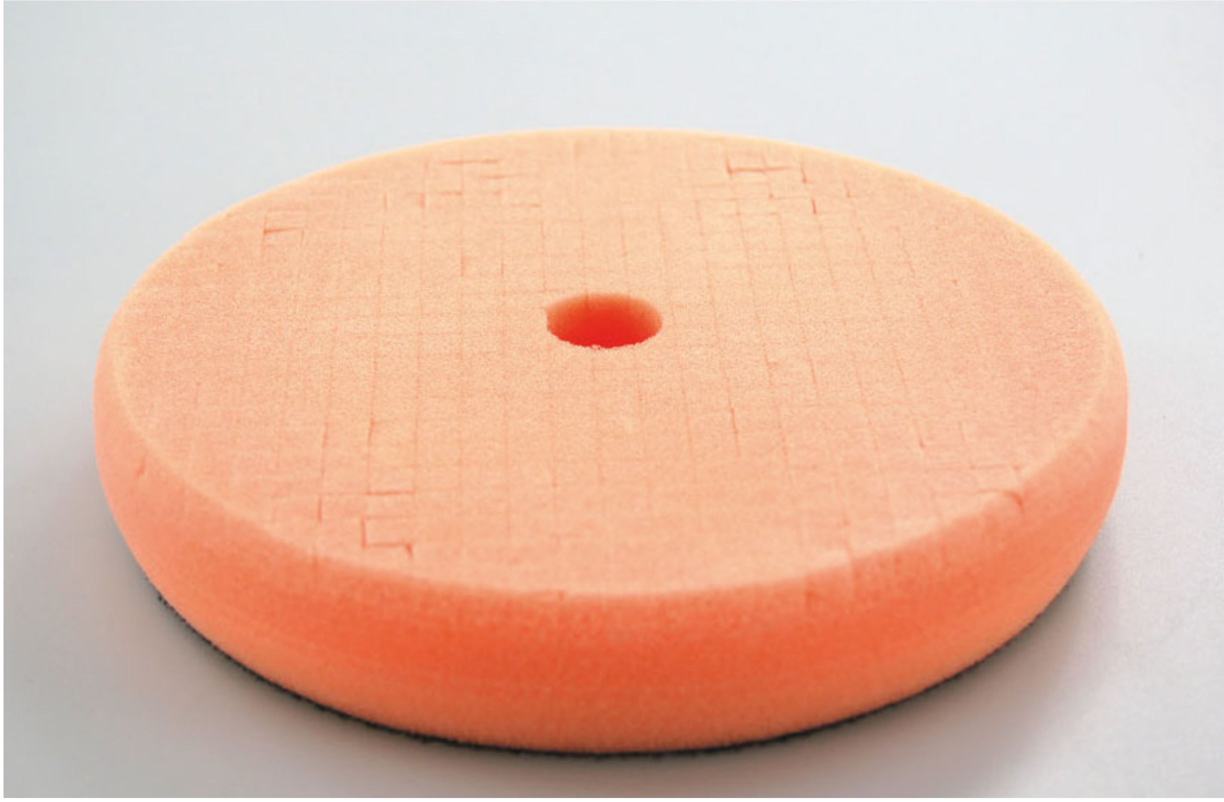
There are no definitive recommendations, just a myriad of possibilities and choices – and one choice may be right for you, the paint you are tackling, and the results you want to achieve. What is sure, however, is that pad design plays a relatively small part in pad performance when compared to the hardness of the foam, its density and its structure (whether it is open- or closed-cell). Foam hardness (firmness) directly affects friction/abrasion, and this also correlates with heat build-up at the polishing face. Dense foams (measured in ppi – pores per inch: the more ppi, the denser the foam) prevent polish soaking deep into the foam, keeping the abrasives on the surface of the panel, but they may exhibit less physical cut due to a smoother and less aggressive surface texture. 'Tall' foams have less rigidity and may run cooler, limiting cut, but can be helpful in keeping the pad flat against the paint surface due to their inherent malleability. And closed-cell foams tend to cut more than open-cell foams (*see* box overleaf).

Furthermore, the overall cutting characteristics of a pad will vary for different users: some robust, firm foams can be 'leant on' heavily at low speeds giving a grinding 'slow cut', whereas other foams would collapse too much and therefore rely on heat from higher polishing speeds to cut paint to the same degree.

The following face types are available for foam pads:

Flat: The standard foam pad type – a simple flat face. Cut tends to be focused on the pad centre and around the pad edge. It is prone to initial splatter/sling.

Waffle: Probably the most famous pad design, with the foam being cut in an 'egg-box' style to create high and low points (peaks and pockets). These may run fractionally cooler than standard flat pads, and tend to sling less. This type of pad also seems to 'flow and fill' around awkward areas and uneven surfaces better than a flat pad.

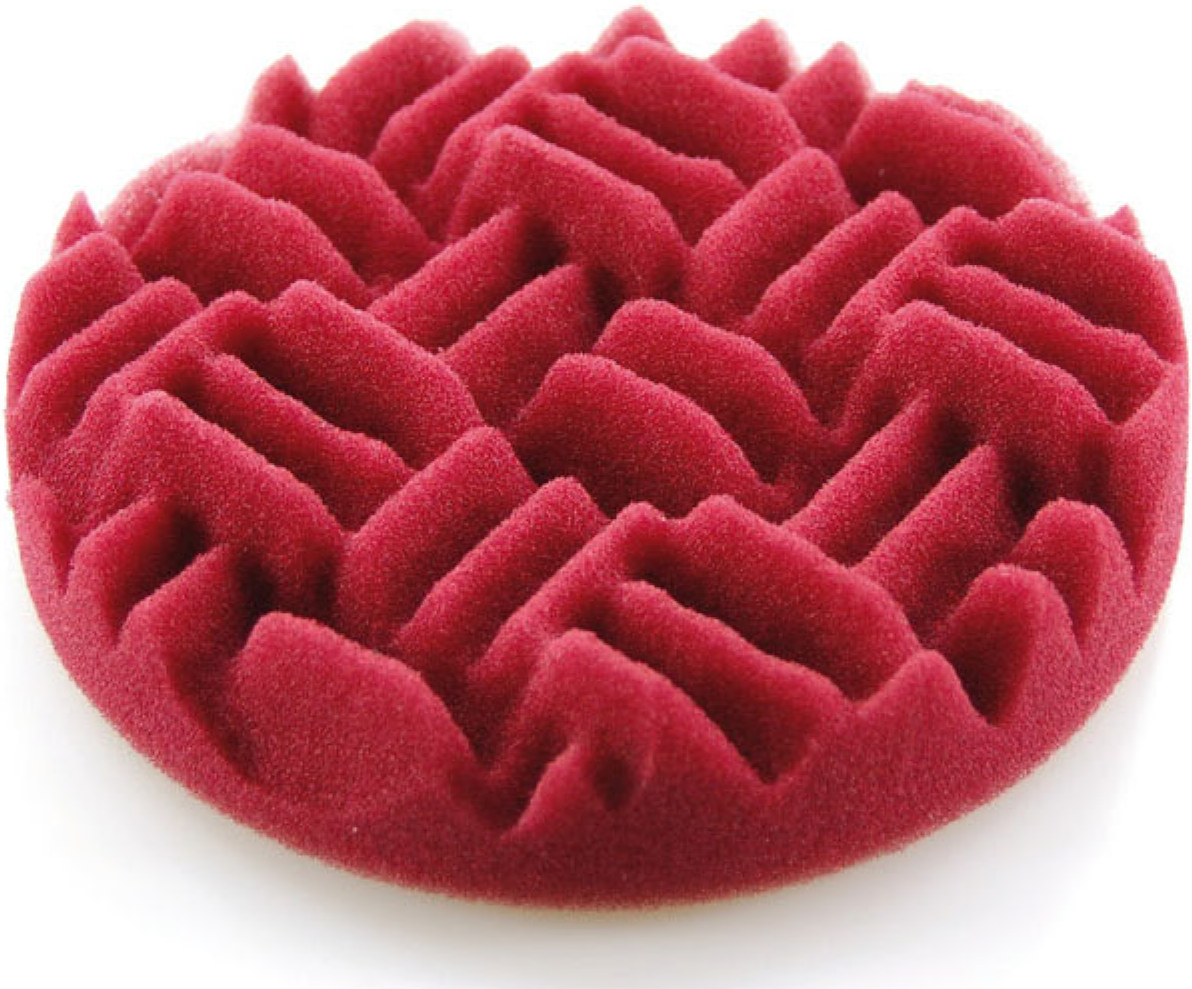


Slots in the foam allow compounds to sink deep into the pad structure, extending the polish working time.

Linear slot: The pad surface here consists of a number of cuts or grooves in a linear pattern, to help polish become absorbed into the body of the pad, and allow the pad face to ‘flow and fill’ around uneven surfaces (small foam ‘blocks’ are created that have a limited amount of individual movement). There is less chance of sling with this pad design, and working times for polishes tend to be longer, due to the absorption.

Hex pads are very popular, but their technical advantage over standard pad designs seems to be relatively small.

Hexagon slot: The hexagon slot design gives shallower but more stable blocks of foam on the pad face. It reduces sling fractionally but allows almost as much cut as with a flat-faced pad, as most of the pad surface is in contact with the paint surface. A degree of its popularity may also be attributed to its attractive look: the hexagon pattern is pleasing to the eye, and looks as if it may have some kind of technical or mathematical advantage.



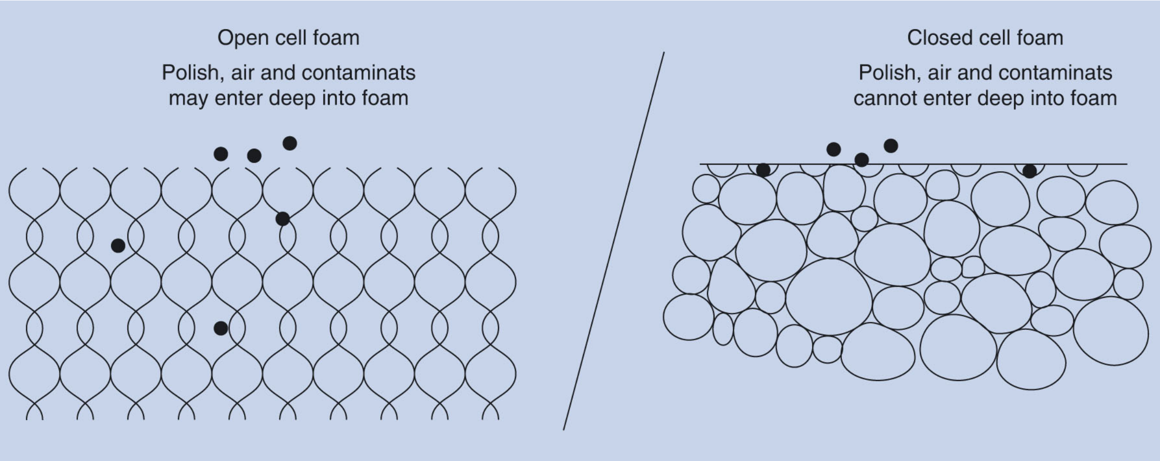
Effectively a 'super waffle', the fin or blade design attempts to reduce sling and lower pad temperatures. These pads suit rotary polishers more than orbital machines.

Fin/blade: These pads have deep grooves in the pad surface, and a number of tall fins or 'blades' to cut the paint, often at right angles to each other in an attempt to reduce marring. The advantages are a consistent cut across the whole pad face, as well as lower pad temperatures and a reduction in sling. It is, in effect, a more pronounced version of the 'waffle' design.

Compressed pads respond to pressure during the polishing process; they are designed to deform (in a positive sense).

Compressed pads: One innovation in pad technology is the use of a compressed pad design – where the pad is bowed in its natural state, and then flattened under compression when mounted on the backing plate – with ‘flaps’ on the pad surface (effectively, linear slots opened under compression). Polish can rise up into the pad between the flaps, meaning that under light pressure there is only a little polish in contact with the paint, giving a light cut but high refining ability. If you apply pressure, the flaps flatten, bringing more polish into contact with the paint to raise the cut but in turn reduce the refining ability. The foam at the centre of the pad is also made denser under compression, increasing cut further.

OPEN-CELL VERSUS CLOSED-CELL FOAMS


Open cell foam
Polish, air and contaminats may enter deep into foam
Closed cell foam
Polish, air and contaminats cannot enter deep into foam

Open-cell versus closed-cell foams.

Open-cell foam has higher air and fluid flow through it, generally reducing cut.

Closed-cell foam keeps compounds working at the pad surface for longer, and generally has a higher cut.

Open-cell foams have a ‘porous’ structure that allows airflow and fluid flow within the foam itself. This allows open-cell pads to run cooler, but conversely they may absorb polish, and if it migrates from the pad face then workability (via lubrication) may be compromised and the risk of marring may increase (because the polish particles may not be broken down as quickly or as extensively). Opencell foam is also ‘spongier’ in feel, thanks to a less rigid internal structure, and this tends to mean a softer, gentler cut suitable for lighter polishing (for example, the finishing process).

Thus the general characteristics of opencell foams are as follows: they are less rigid, more porous, and have a cooler cutting temperature and a lower cut than for the same closed-cell foam.

Closed-cell foams are made up of clusters of isolated bubbles; air and liquid cannot travel through the structure. This results in higher pad-face temperatures and less polish absorption. a compound will be ‘worked’ on the paint surface for longer and be constantly under more pressure (generating more cut if a non-diminishing abrasive, or breaking down more quickly if diminishing in nature). The rigidity of the pad means that this firmer foam suits higher cut applications, although a lot does depend on the actual softness of the foam material used.

The general characteristics of closed-cell foams are therefore as follows: they are more rigid, and less or non-porous; they have a higher cutting temperature and a heavier cut; and they break down diminishing abrasives slightly faster than the same open-cell foam (reducing cut but also reducing marring; this means that non-diminishing abrasives are particularly suited to closed-cell foam pads if a heavier cut is required).

Wool Polishing Pads

Machine marring – 'hologramming' – can look unsightly but is usually relatively easy to correct.

Like foam pads, wool pads come in a variety of sizes and types, but they tend to have a far more exclusive role to play, namely heavier cutting by rotary polisher. Due to the long pile length of the pads, they do not generally suit orbital polishers with their eccentric throw and oscillations, and are really suited to rotary machine polishing, where there is less chance of the fibres becoming tangled or matted. Although short-pile wool/rayon pads do exist for orbital applications, these are not very popular, and it is more likely that a suitable microfibre pad would be used instead (*see* below).

Wool pads have a well deserved reputation for fast paint removal. However, this is not the case for all wool pads, and some have been brought on to the market made of very fine wools (for example, merino), offering a lighter intermediate cut for those who like the ‘feel’ and cooler-running nature of a wool pad (they tend to generate less heat than a foam of the same cut).

Traditionally, though, wool is used for more aggressive correction and is the source of the phrase ‘mopping’, a bodyshop term for machine polishing (derived from the fact that wool polishing pads resemble the shaggy wool floor mops that were historically used for janitorial duties, rather than the urban myth that it comes from the acronym for ‘machine-operated polishing’). In a bodyshop, wool pads are used to remove sanding marks after the ‘de-nibbing’/sanding process (that removes dust and other nibs of dirt) from the freshly painted surface. For a detailer, it is an aggressive pad for harder paint types.

In both circumstances, subsequent refinement using gentler pads and polishes will be required, as wool pads – like most high cut pads – are likely to leave behind micro-marring, often referred to as ‘machine marks’ or ‘machine holograms’. These are very faint and shallow scratches made in regular circular patterns, which give the appearance of ‘shimmering’ (like a hologram) in direct sunlight, especially on dark paintwork. Whilst these holograms are extremely unsightly, they are usually quite easy to remove with just one further polishing stage.

Wool pads can also lint heavily on first use, and can be quite dusty in operation if they haven’t been cleaned properly, perhaps introducing a marring risk to soft paint.

So why are they so popular if foam pads also come in heavy-cut grades? Simply because wool can be more pleasant to use than aggressive foams, generating less heat for the same amount of cut and thereby extending polish working times and minimizing the risk of strike-through on plastic panels, such as bumpers. They can also last much longer than coarse foam pads, which can quickly ‘feather’ or otherwise break down.

Wool pads are available in multiple 'ply' versions, for an even heavier cut – the rope-like wool strands are stiffer and therefore more aggressive in action when cutting paint.

Wool pads come in standard pile or twisted multi-ply variants, where the wool fibres are spun into rope-like strands. These are more abrasive in action because the wool strands act like firm bristles. Care must be taken when cleaning these pads, as unwound strands will lose their form and firmness, reducing cut.

Even if a soft wool pad is used, care should be taken to avoid removing too much paint, which can result in a strike-through. Working times are typically shorter with wool pads, especially when merely correcting swirl marks, as the rate of paint removal is usually much faster for the same polish/compound.

Microfibre Polishing Pads

Microfibre pads have revolutionized the orbital machine-polishing process, allowing wool-like cut with little chance of unwanted marring.

Microfibre pads are primarily for use with an orbital polisher. The microfibre pad is very different to the traditional foam pad: the surface of the pad is made up of a microfibre material that is supported by a thin layer of foam. The density and compression of this supporting foam is altered by manufacturers to give a variation in cut between finishing and cutting characteristics.

Microfibre pads were created for fast and heavy cutting using an orbital polisher in an effort to make it a correction tool to match the rotary polisher. Because long-pile wool fibres would not work with the oscillating or eccentric action of orbital machines, short-pile microfibre was the ideal solution. This was softer as a material than the short-pile rayon or wool already available, and therefore generated less friction – meaning less heat and secondary ‘hologramming’ (machine marring).

Coupled to specialist non-diminishing machine polishes (*see* above), they give a higher level of cutting ability to the humble orbital polisher, and can allow for the correction of severe defects on hard paints – often without the adverse side effects of hologramming/marring that plague heavier-cut rotary polish/pad combinations. Note that unlike foam pads, the working techniques are quite different for a microfibre pad system: these will be covered in the 'processes' section below.

Denim, Velvet/Corduroy Cutting/Polishing Pads

Corduroy and denim pads can cut heavily but may leave little marring behind, masking their true aggression.

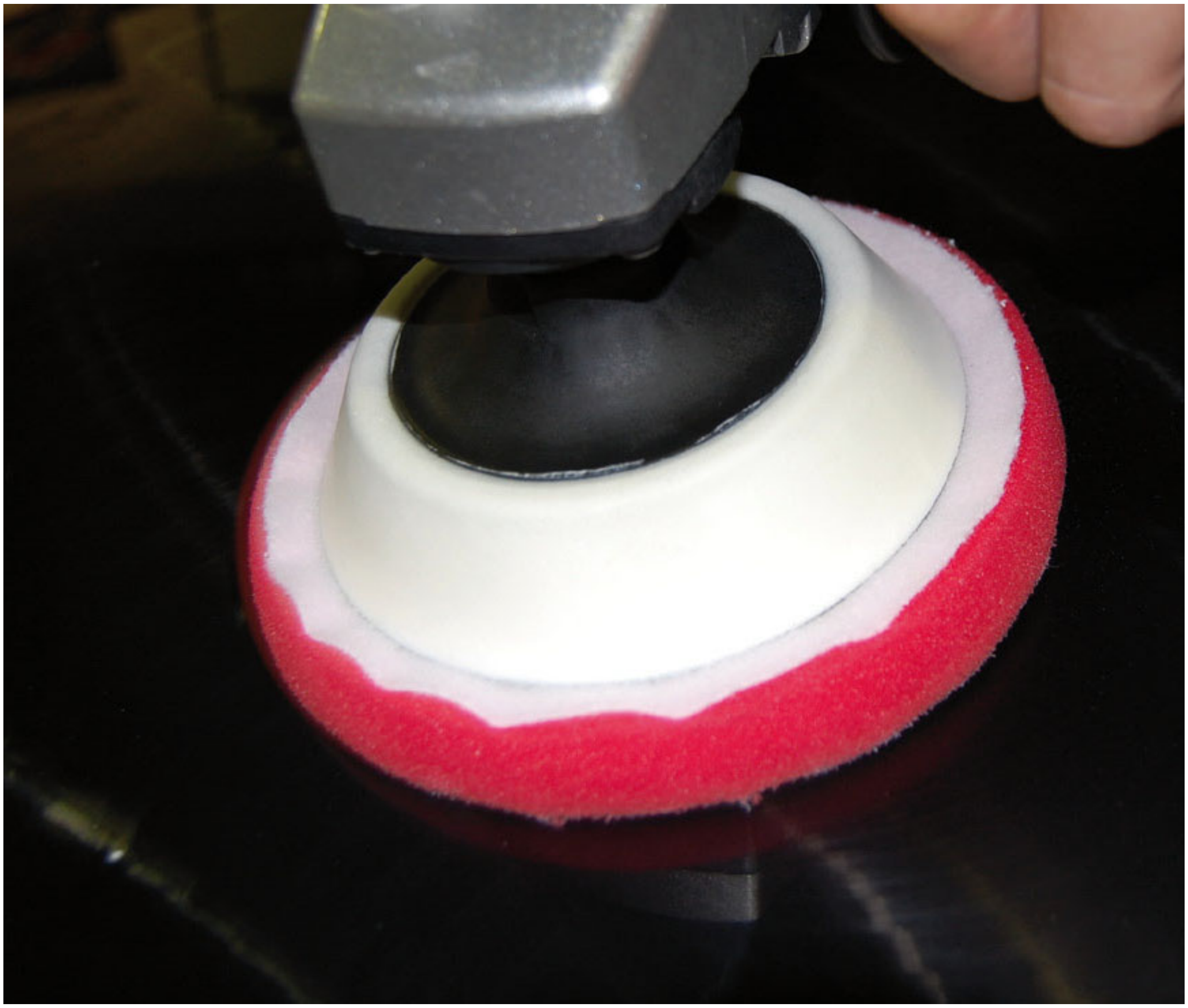
If more cut than that offered by wool or microfibre pads is required, the traditional option has been to 'wet sand' paint by hand or machine, using sanding papers or discs. But there are intermediate pad systems that lie somewhere between wool/microfibre and sanding products. These are denim and velvet/corduroy polishing pads. The construction is similar to microfibre pads, in that they consist of a layer of material on a foam backing. Corduroy/velvet is slightly closer to a microfibre pad in terms of cut than denim – denim is the most aggressive, having a flatter profile and absorbing less water than corduroy for lubrication and cooling. Unlike normal sanding discs, these discs polish during the paint removal process, and therefore won't leave behind a traditional dull and marred finish; this makes them particularly dangerous, as the finish looks attractive yet the cut can be severe. Whether these are 'soft' sanding discs or 'heavy' polishing discs is really a matter of debate; the denim pads have a fearsome rate of paint removal and are particularly suited to removal of ‘orange peel’ defects in paint (a relatively deep defect). They may create less secondary marring or hologramming than wool pads or sanding paper/discs if used in the correct manner with an orbital machine, but obviously the risk of strikethrough remains substantial.

For most detailers, microfibre or wool pads give enough cut without the severe risk of strike-through presented by a denim pad used with a rotary polisher.

SANDING PAPERS/DISCS

These have been mentioned above in the polishing media section, although it is questionable whether they are classed as media or equipment. In terms of cut, these ‘grit’-covered papers or discs are highly aggressive because there is no cushioning and the materials acting on the paint surface are very abrasive.

BACKING PLATES (FOR ORBITAL OR ROTARY MACHINES)



The edge of a 125mm backing plate is kept away from car bodywork when using a larger 150mm foam pad.

The backing plate connects the pad to the machine, and is usually a plastic disc with a threaded attachment to suit the type of machine (a female M14 metric connection for European rotary machines, a female 5⁄8in imperial connection for US rotary machines, or a male 5⁄16in imperial connection for orbital machines – although there may be other connection types). Most backing plates have a ‘hook and loop’ backing for the convenient mounting of pads, and a number of sizes will be available, usually from 50mm to 180mm. The most popular European detailing size is 125mm, for use with 150mm-diameter pads (this allows for a safe margin between the edge of the pad and the unyielding edge of the fast-rotating backing plate – a potential hazard to paint). Note that extension bars are also available to allow backing plates to access constricted areas.

Backing plates serve a number of important functions beyond their role as a mere connecting piece; these include:

Deeply cushioned backing plates can help keep pads flat during machine polishing.

Minimizing heat and vibration: The friction acting on the paint during the cutting process generates a lot of heat, and the machine polisher itself will generate heat during operation. A backing plate acts as heat insulation, whether from the machine to the paint surface or vice versa. It also helps minimize vibrations caused by the mechanical action of the machine (more an issue with orbital machines), from an uncentred pad or from an uneven cut (perhaps caused by some kind of stickiness on the paint surface).

Helping to maintain a flat pad orientation: Orbital pads need to be kept flat on the paint surface during paint correction, and whilst rotary pads can be angled to increase cut or work smaller areas, these are often kept flat to the paint surface as well. Even a 1 or 2 degree tilt would lift a solid backing plate – causing an uneven cut from a non-cushioned pad, hot spots and even a tugging or jumping action. Foam pads are naturally cushioned, which helps, but having a cushioned backing plate can give even more leeway and help keep the pad flat even when tilt angles are relatively large.

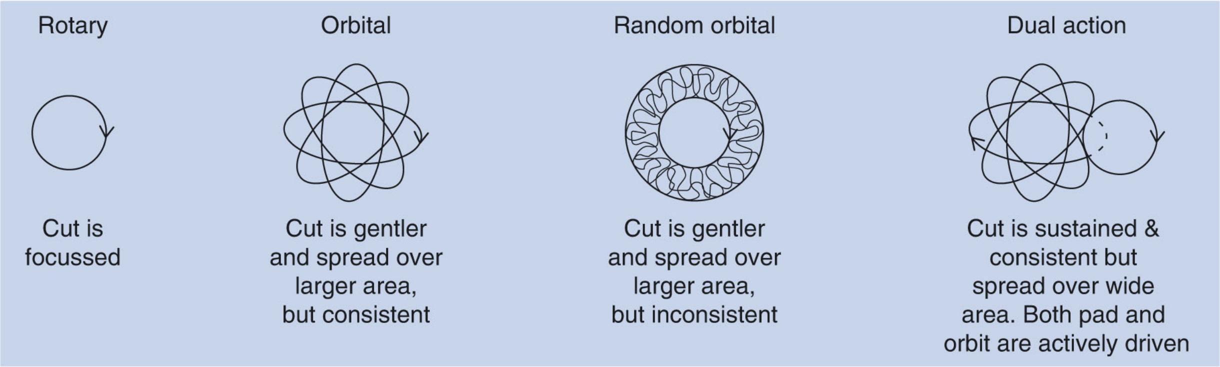
When angling a pad to 'focus' cut, softer backing plates may minimize the risk of the backing plate pushing through the foam.

Tailoring and transmitting the cut: Heavily cushioned pads absorb more compression than solid backing plates, reducing cut. However, a heavily cushioned pad (when used with a rotary machine) may allow the pad to be angled safely, and angling a pad may dramatically increase cut by focusing pressure and heat on a smaller area.

Note that some orbital and sanding backing plates are perforated to aid cooling or dust extraction, although standard rotary backing plates are likely to be free from additional holes to maintain rigidity and longevity. Backing plates will normally only break down from the action of extreme heat, vibrations, tearing or poor maintenance (for example, leaving them soaking in detergent as part of a cleaning regime). Thus, extreme heat may melt the glue used to stick the hook-and-loop backing material to the backing plate; harsh and unsympathetic tearing of a pad away from the backing plate may loosen the hook-and-loop backing; and starting/stopping an orbital polisher off the panel may lead to excessive vibration that aggravates tearing.

Heavily cushioned backing plates tend to have a shorter lifespan than solid backing plates. Thin, firm backing plates therefore last longer when used with orbital machines and transmit more cut, but they can transfer more heat, and they won't allow as much latitude when it comes to keeping the pad level, perhaps increasing the chance of vibration or 'pig tails' (*see* below).

MACHINE POLISHERS


Rotary
Orbital
Random orbital
Dual action
Cut is focussed
Cut is gentler and spread over larger area, but consistent
Cut is gentler and spread over larger area, but inconsistent
Cut is sustained & consistent but spread over wide area. Both pad and orbit are actively driven

Rotary versus orbital polishing actions.

Machine polishers come in two main types: rotary, where there is a concentric polishing motion; and orbital, where there is an eccentric polishing action. These different motions mean that the machines act in different ways, giving the detailer flexibility in tackling varying paint finishes.

Orbital Machine Polishers

The DAS-6 is one of the best known orbital machine polishers, and tens of thousands of units have been sold worldwide. It is a 'clutched' machine, making it perfect for beginners.

Orbital machine polishers are divided into three main categories: clutched orbital, driven orbital (dual action or DA) and random orbital.

Clutched Orbital

Years ago, the vast majority of paintwork polishing was carried out using rotary polishers with wool 'mops'. These polishers are still the mainstay of most bodyshops and professional detailers, and when used correctly they can deliver spectacular results. However, owing to their nature where the pad spins on a fixed spot, they focus their cut, and the resulting heat build-up could lead to strike-through in the hands of an inexperienced user. Rotary machines are also susceptible to leaving behind secondary marring, known as 'machine holograms' – small, circular micro-scratches caused by the use of heavier-cut polish and pad combinations.

This led to an interest in orbital machines, which could cut more gently with less chance of residual holograms, especially the 'clutched orbital', the safest of them all. This has an eccentric orbit, but only the main spindle is actually driven; the secondary orbital gear that provides the eccentric motion isn't locked, but can freely rotate if the resistance offered by the paint is too great. In other words, when you increase the pressure applied to the head of the machine, the rotating part of the motion slows down. It is similar to having a clutch in a car: you release the pedal pressure to engage the clutch and get drive. This 'clutched' action means that there is always a limit to the amount of cut provided: once the surface friction overcomes the torque of the machine, it stops turning. A rotary machine, on the other hand, will keep on cutting.

Driven Orbital (Dual-Action or DA)

All orbital machines get called 'DA' machines, despite the fact that only a few have a true dual action. Dual action strictly refers to a driven spindle and a driven orbit (one tends to lead to the other, through gearing). Thus although the name of the clutched orbital machine DAS-6 stands for 'Dual Action Sander 6' ('6' is likely to refer to the orbital throw of 6mm), it is in fact a clutched orbital and therefore not strictly 'dual action'. True DA machines are particularly effective polishing machines, but have a higher risk factor of marring and strike-through than clutched orbitals. With enough pressure they won't 'bog down' or stop, but simply keep on cutting, regardless of the applied pressure. This can make polishing with one of these machines an uncomfortable experience for the novice user as they can be quite 'grabby' (like rotary machines), but once mastered they are an excellent stop-gap between rotary and clutched orbital machines, offering some of the advantages of both styles of machine.

Random Orbital

The head of random orbital machines does not move in a set eccentric orbit: it is free to move anywhere it wants within the confines of its casing. This means that it is a truly random orbit, and the head can be thrown anywhere, every revolution. In technical terms, random orbital machines will not be DA machines with a driven orbit, and are closer to the clutched orbital in terms of design and effect. However, their cut may be even less than the clutched orbital machines, as the random orbit potentially generates less heat than a geared eccentric orbit. True random orbital machines are not common and are usually only found as air tools. Most electric orbital polishers will be DA or clutched orbital machines.

Rotary Machine Polishers

The rotary polisher is the classic paint correction machine, beloved by bodyshops and detailers alike.

Before dual-action polishers became widely available, rotary polishers were the only choice for detailers who wanted to perform paint correction by machine. Perhaps it is the greater experience that is required to master it, or the speed with which it corrects, but the rotary polisher is seen to be the tool for the master detailer to use for paint correction. In truth, having both orbital and rotary machines would be very wise for any professional detailer because different paint types require a variety of polishing styles that can only be achieved through the use of multiple machines.

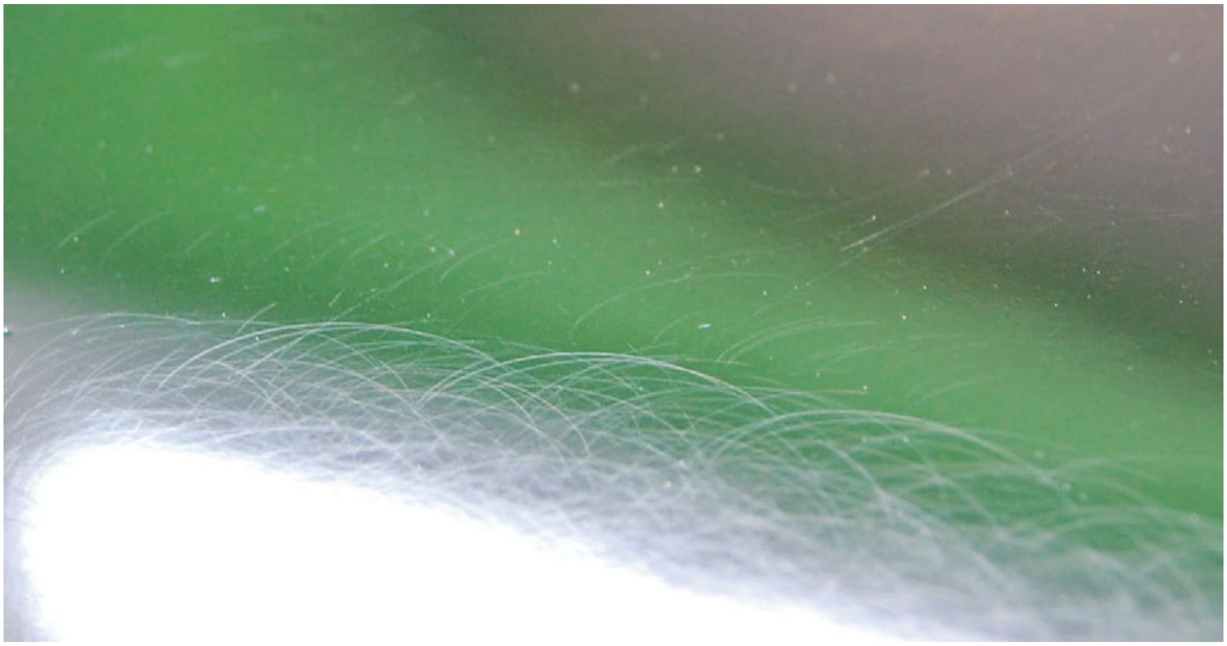
As illustrated by the prior diagram, the rotary polisher spins the pad in a circular motion at various speeds (usually measured in revolutions per minute). This can, as alluded to previously, generate much more heat (due to a focused cut) than is possible with an orbital machine, and it means that the rotary is often unfairly reputed to be a highly aggressive machine that will strike through paint with impunity. The reality is, of course, quite different, and with care and practice, the rotary polisher is a benign and very capable machine.

A rotary machine does, however, cut harder and faster than an equivalent orbital machine – of that there is no mistake or doubt. There are shorter working times to be enjoyed, but larger strikethrough risks to be considered, and this is especially noticeable at the higher end of the cutting scale. For severe correction where aggressive compounds are required, an orbital machine polisher requires a lot of time and patience to achieve the desired results. Indeed, many detailers may give up and seek alternative means to correct the paint. A rotary polisher, by contrast, can cut far more effectively, especially with wool pads.

Ironically, rotaries can also excel at finishing. The consistency of the pad motion results in diminishing abrasives being broken down more evenly, which has been demonstrated to give a slightly sharper finish than using the equivalent polish by dual-action polisher. This is not to say the finish delivered by a dual-action polisher will be poor in comparison – far from it. You will only notice the ‘rotary enhancement’ with diminishing polishes on certain paints, generally soft, non-metallic, dark paints.

WET SANDING BLOCKS AND ORBITAL SANDERS

For heavy cutting of paint, where the defects to be removed are too deep or traditional machine polishing techniques would prove time-consuming, a more aggressive approach is required: wet sanding. Whilst sanding paper of the requisite grade could be used on its own, the chance of an inconsistent cut is very high due to varying pressure if a block isn't used. Blocks keep the pad completely flat, and in contrast to polishing pads they should not be cushioned: they need to be unyielding to ensure that paint defects such as orange peel are 'sliced' effectively (otherwise the paper will follow the contours of the peel and it may not be fully removed).



These small semi-circular sanding marks are called 'pig tails'.

Whilst sanding by block is arguably the most traditional and most effective route for the skilled detailer, the demand for a faster result has seen the introduction of orbital sanding machines, powered by electricity or air. These are usually 'short-throw' machines, meaning that they have a small eccentric orbit as compared to regular orbitals. This is because cushioning is largely absent from pads and backing plates when sanding, and if the machine operates at a slight angle to the paint, the edge of the pad can dig into the paint at the far reaches of its eccentric throw. This causes a small semi-circular defect, commonly referred to as a 'pig tail' (due to its shape). A longer throw would result in a deeper pig tail, so a short-throw action is critical.

Kept flat and with cushioned pads, pig tails can be avoided with short-throw orbital sanders, and the speed and consistency of these machines may be attractive to many. But they have limited success removing orange peel when the pads are heavily cushioned, as the user cannot feel what is going on beneath the sanding paper so distinctly – catching a particle of contaminant accidentally during the sanding process may lead to a deep pig tail that subsequently proves tricky to remove. Sanding by hand makes this less likely.

Of course, sanding papers can be used with standard long-throw orbital machines, or even rotary machines, but the risk of inadvertent damage is immense. Strike-through and pig tails will invariably dictate that a more cautious approach should be taken.

ORBITAL OR ROTARY: WHICH IS THE RIGHT MACHINE FOR YOU?

Orbital or rotary? The right answer for the committed detailer is always going to be ‘both’. Rotaries cut faster and, if you only want to buy one machine, have more versatility. They also tend to be cheaper than orbital machines. But most newcomers to machine polishing will start with a clutched orbital as they are safer to use and tend to be easier to control, making them ideal ‘starter’ machines. That isn’t to say that orbital machines are shunned by experienced detailers: far from it. Sometimes the paint is so soft that any kind of correction by rotary is going to mark the surface, and an orbital machine will be perfect.

Orbitals are also excellent when dealing with ‘sticky paint’, a particularly difficult paint condition to tackle with a rotary. Sticky paint is often caused by a rapid development of heat during polishing, which dries up polishes long before they have had a chance to work. The lack of heat generated by an orbital machine makes them a very valuable tool for paintwork like this. And whilst orbital polishers previously had a reputation for poor cutting performance with harder paint types, higher-powered machines with microfibre pads mean that this is no longer an overriding consideration.

POLISH APPLICATORS

Microfibre is a natural choice of material for the application of liquids and polishes, but foam would also suffice. This applicator has a finger pouch for better purchase.

Hand polishing is normally achieved using polish on a cloth, a polishing pad or a polish applicator. Pads are difficult to hold unless they are secured in a special hand grip, so polish applicators – microfibre-covered foam cushions – are normally used. These sometimes have a ‘finger pocket’ design to allow better purchase during use, and they tend to be soft in texture to prevent inadvertent paint marring, although coarser materials could be used to increase cut. The foam doesn’t have to be microfibre-covered – plain foam would suffice – but the microfibre seems to help contain and protect the foam inner during aggressive hand polishing, preventing it from tearing or disintegrating prematurely.

PAINT THICKNESS GAUGES

Paint thickness gauges can be useful, but they need to be used correctly, and their results understood, if they are to be relied upon.

The aim of paint correction is to remove a microscopic layer of paint to a level at, or just below, the defect. It is important not to remove more paint than necessary because there will be a danger of strike-through (removal of a whole layer of paint, striking through to the surface beneath and normally necessitating a respray of that panel or area). This means that detailers are concerned with two issues: first, how much paint is on the car currently – that is, how much paint there is to ‘play with’; and second, how much paint is being removed, or has been removed, during the polishing process. (As a rough guide, a clearcoated car may typically have paint that is 100–200 microns in total thickness; more than 200 microns may indicate a respray or accident repair; 80–100 microns would be considered ‘thin’ paint; and less than 80 microns of paint could be considered too thin to correct safely.)

Paint thickness gauges (PTGs) are available to help guide the detailer in these areas, working usually via ultrasonic or magnetic means. Ultrasonic gauges send a sound wave through the paint coating (like an ultrascan) and examine the reflected waves. Magnetic PTGs examine the strength of signal from the ferrous car bodywork beneath the paint; thin paint shows more magnetism than thicker paint. Eddy current detectors also exist, often in combination with magnetic measurement within the same instrument. Unfortunately, paint gauges have their limits and need skilful operation: they should be used for guidance, and not taken as gospel.

Firstly, paint is rarely a single layer. Modern finishes are generally clearcoated, and most gauges will not distinguish between layers. Knowing there is 140 microns of paint on the car overall is only marginally helpful when the clearcoat layer is an unidentified 30–40 microns, and striking through this layer would mean a respray – and the removal of as little as 12 microns could lead to premature clearcoat failure, with it peeling, flaking or losing its gloss (most UV protection is found in the uppermost part of the clearcoat layer). Even the gauges that can measure layers may struggle to identify ‘wet-on-wet’ paint layers, where fresh paint is applied to a tacky sublayer to increase adhesion.

Secondly, ferrous gauges won’t work on plastic, GRP or carbon-fibre surfaces – they need metal to work. So it would not be possible to measure plastic bumpers – one of the most likely parts of a car to suffer strike-through due to their complicated angles and higher heat build-up/retention – by traditional PTGs.

Thirdly, paint may swell when hot, and the friction of machine polishing can create high temperatures (60–70oC is common, but machine polishing can sometimes leave a panel too hot to touch in some cases). When it swells, paint thickens and can therefore give a spurious PTG reading.

Fourthly, paint is not consistently sprayed the same thickness all over a car. Some areas will have less paint because the manufacturer considers that thinner paint (or a lack of clearcoat, say in door shuts or the boot area) is satisfactory. Even the same panel will give a spread of readings, and the lip of panels may see a marginal increase in thickness because paint may 'gather' there during spraying and curing (note that there is a much higher strike-through risk on lips and edges of panels, despite the potential extra paint thickness, because point pressure when machining easily overcomes the marginally thicker paint). And finally, the history of the paint may not be fully revealed by a gauge.

SMART repair 'blends' – quick 'touch-in' paint repairs edging up to original panels – and custom paint finishes such as pinstriping are relatively delicate and may be damaged or removed by machine polishing, whatever the PTG says. You may spot the SMART repair by taking readings over the whole car, not just the part you are polishing – but finding that blend is going to be difficult. And what if the whole car has been aggressively machine polished before your ownership period and very little clearcoat is actually left anywhere? The pitfalls are obvious.

Paint gauges are useful, however, at determining an average thickness to the paint, and in deducing whether the paint is likely to be original or if certain panels have been previously corrected (check in the middle of a bonnet, for example, compared to 5mm in from the bonnet edge). Always take multiple readings, never just one or two. And if a PTG is used to try and calculate paint removal rates, it is advisable to use a laser pen to mark a spot on the paint so that measurements can be taken from the same point, and to take all readings when the panel is cool. Once again, never take just one: take many, perhaps dozens, over the whole panel. You may be surprised how much the paint thickness varies (although large variations will suggest previous repairs, rather than just inconsistent spraying).

JUDGING CLEARCOAT THICKNESS ACCURATELY: IS IT POSSIBLE?

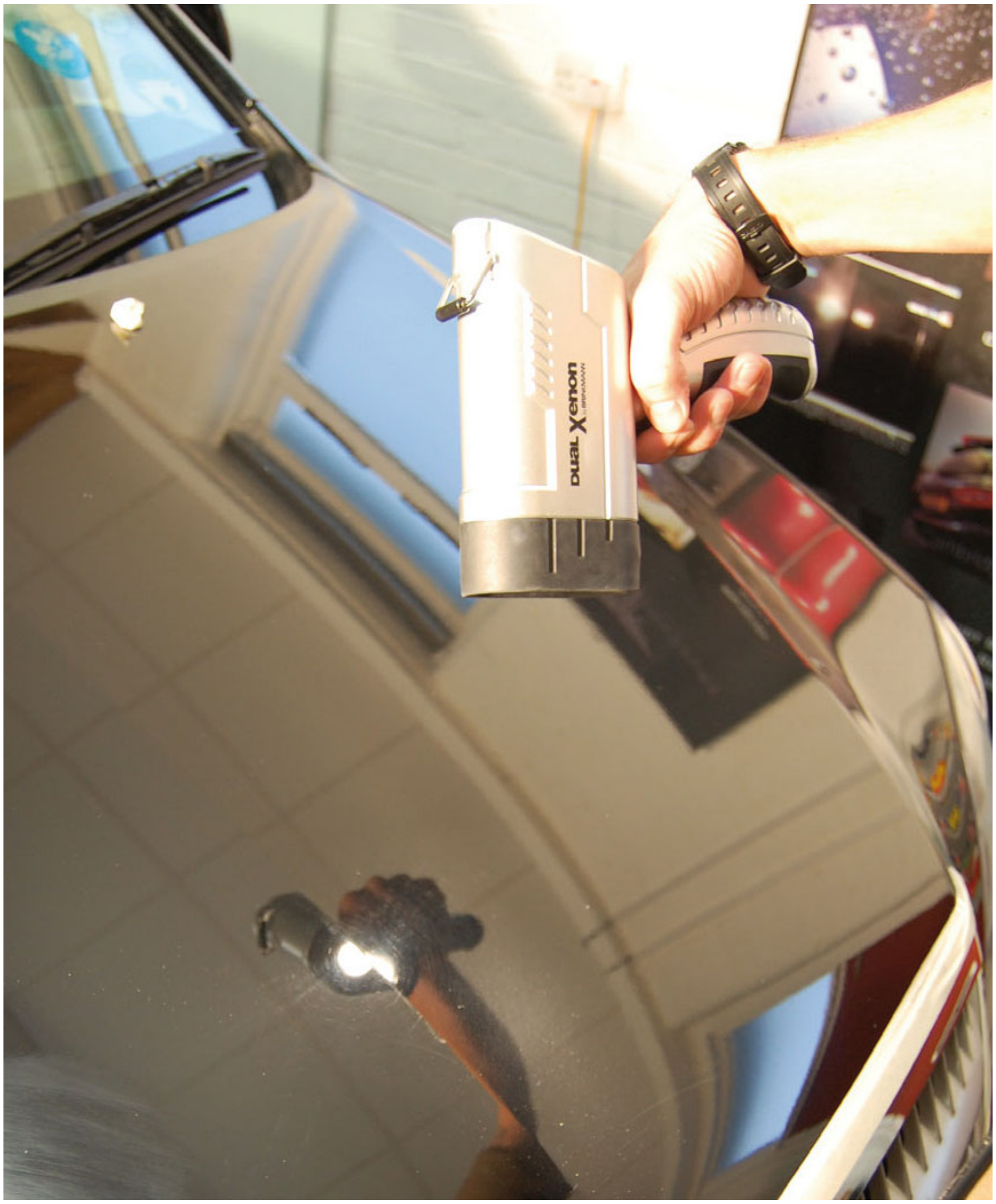
Door jambs are sometimes left unclearcoated, giving you an opportunity to deduce the thickness of the colour-coat layer. If the jamb is clearcoated, try a panel inside the boot.

In short, it isn't really possible to judge clearcoat thickness accurately unless you have a PTG that can read multiple layers accurately and you are proficient in its use, and know how the car has been sprayed (without wet-on-wet layers, for example). If you are using a single-layer PTG then the information gleaned will be much vaguer because it won't be able to distinguish a thick clearcoat and colour-coat finish from a thin layer of clearcoat covering a thin layer of base coat sitting on top of another thin layer of bodyshop filler. However, it can be enlightening to measure a clearcoated part of the car – such as the door – and then an area of the car that may not be clearcoated, such as the door jamb. If there are 30–40 microns of difference, this could give a reasonable indication of clearcoat thickness – but remember that there are too many variables to treat this as a wholly accurate measurement.

Care must always be taken; caution must always be exercised. PTGs are not the miracle tool that they may appear to be upon first discovery. Rather, they are good at identifying whether paint is likely to be original, and how consistent the original paint finish may be across all panels of the car. This is useful, but not infallible. This makes them essential for professional detailers, perhaps, but less so for amateur detailing enthusiasts, especially if they only work on their own car and know the history of its paint.

SWIRL-SPOTTING LIGHTS

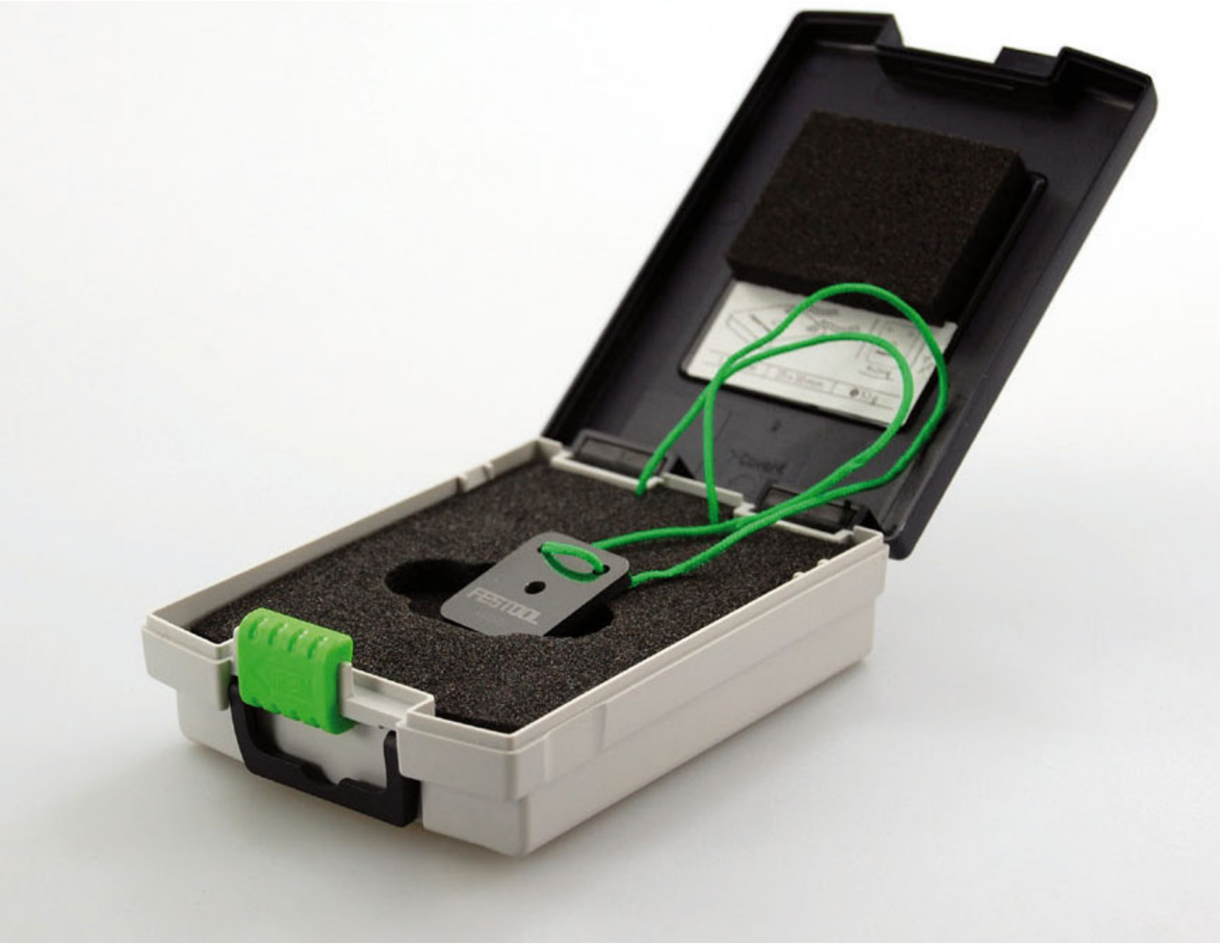
Assessing the defects to be removed is an essential part of paint correction, and the detailer usually turns to a 'spot' light source, usually a hand-held torch of some kind. The most famous is arguably the 3M 'sun gun', a fan-cooled rechargeable lamp with a daylight spectrum halogen bulb (natural sunlight is best at uncovering paint defects). More affordable alternatives are Brinkmann halogen torches and 'white light' hi-output LED torches. Whatever the device, the principle remains the same: to provide a spot source of light on to a panel to expose the defects thereon. By viewing the light spot at various angles, microscopic scratches, scuffs, marring, etching and other defects such as orange peel, should be revealed. As long as the light is intense and a reflection is seen (light will be scattered by defects but will reflect perfectly off 'good' paint), then the process should prove effective. White 'daylight' bulbs may help to expose resprayed areas or SMART repairs because the colour match may be different between the old and new paint.



Angling the light source 'towards' you may help reveal any paint defects present.

Lights don't need to be hand held, of course, and halogen/LED spotlights on tripods – or even the sun itself – could show up swirl marks and other defects adequately. The most important aspect is always maintaining a position where the correct reflection can be achieved; this tends to be by holding the torch/gun at a distance, then aiming it back 'towards' you, pointing towards the panel at an angle of approximately 45 degrees.

STONE-CHIP REPAIR KITS AND DE-NIBBERS

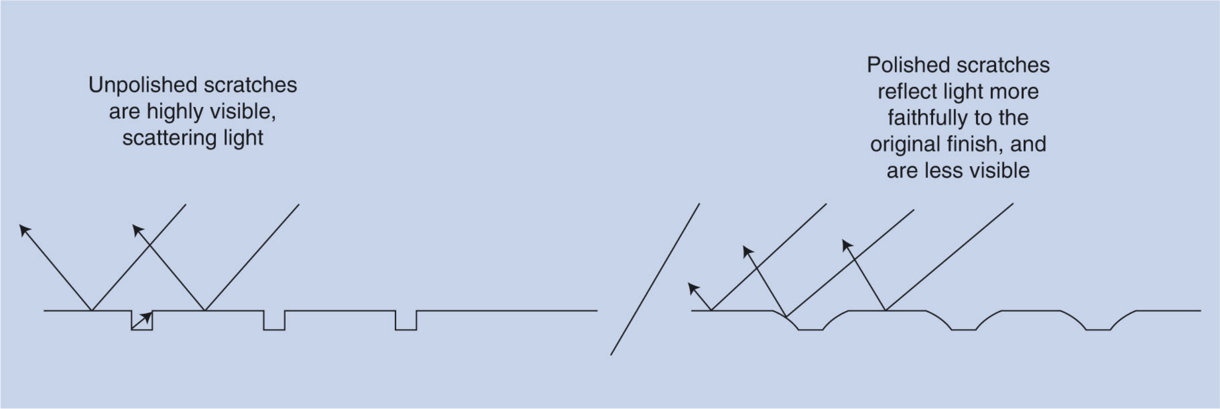


The tungsten carbide blade of this de-nibbing tool will level raised stone-chip inserts without removing paint from the surrounding area.

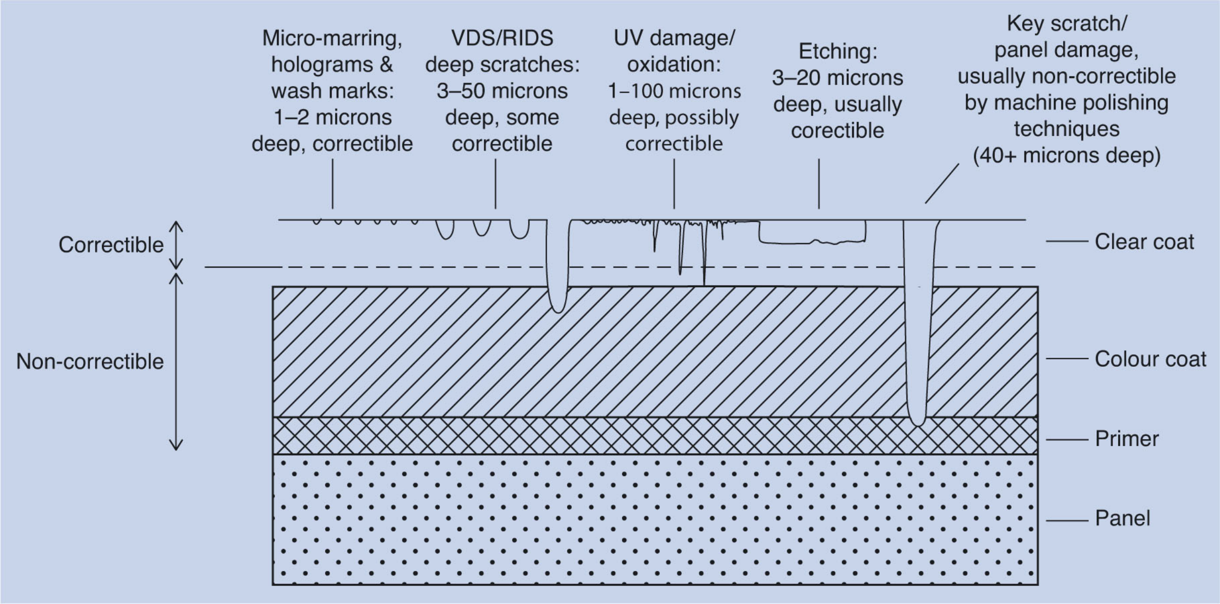
Strictly, stone-chip repair kits and de-nibbers are not paint correction equipment, but items used for paint renovation. However, their use normally directly precedes machine polishing, and stone-chip repair could be considered a precursor to paint correction.

Typically, a stone-chip repair kit will include a small amount of the requisite base colour paint, some clearcoat, and various accessories for application. All that is really needed is the base coat (colour-matched) paint. Once the paint has been applied to the clean chip depression as a ‘bubble’ that sits proud of the surrounding paint surface, it is left to fully harden and is then sanded down or cut ‘flat’ by a specialist de-nibbing tool (usually a tungsten carbide blade).

THE PAINT REMOVAL PROCESS


Unpolished scratches are highly visible, scattering light
Polished scratches reflect light more faithfully to the original finish, and are less visible

Rounding off scratches.


Micro-marring, holograms & wash marks: 1–2 microns deep, correctible
VDS/RIDS deep scratches: 3–50 microns deep, some correctible
UV damage/ oxidation: 1–100 microns deep, possibly correctible
Etching: 3–20 microns deep, usually corectible
Key scratch/ panel damage, usually non-correctible by machine polishing techniques (40+ microns deep)
Correctible
Non-correctible
Clear coat
Colour coat
Primer
Panel

Machine polishing: what is correctable?

Before the choice has been made to cut back the paint to remove defects, it is always best to do a final check to see whether paint removal is strictly necessary. Paint removal is a destructive process with positive intentions, but it is still destructive, and may do more harm than good in some circumstances. Careful assessment of the paint is always advised. If the scratch can be felt with a fingernail, it may be too deep to polish out – although polishing may improve its appearance by rounding the edges of the scratch. And if the paint looks as if it has been polished previously, or SMART repaired, it may be too risky to proceed with the polishing process at all. In this case, filling the defects is an option, described in a later section.

Cutting the paint back by hand is relatively inconsistent and time-consuming compared to cutting the paint by machine, so should never be a preferred route. It suits detailers who do not have the equipment or inclination to machine polish, so it is usually carried out on isolated areas or individual panels (for example, where fading of paint is seen, or a scratch has been discovered). If trying to remove a deep ‘key’ scratch, note that these may be beyond the correction capabilities of hand (or even machine) polishing, and that a mere enhancement may be the best result that can be achieved. In these circumstances, it could be far more effective to add paint (using a stone-chip repair technique) or even to respray the panel.

Note that if an isolated area is polished, the surrounding areas may appear visibly different if they remain unpolished to the same degree. Even if the paint is not faded, a difference in the type and quantity of swirls and scratches could be seen. On a heavily marred car, the polished panel will be obvious.

Deeper marks will require more paint to be removed in order to get rid of them. This is the reason that deeper marks take longer to remove – you have to spend more time taking off the additional paint. Also, if the paint is harder, removing a given thickness of paint will take more effort. This could be arduous by hand, so whilst a manual technique may still be possible, it is likely to be far quicker and more consistent by machine.

PAINT REMOVAL BY HAND: MILD DEFECTS

Hand-polishing can yield reasonable results, but can be time-consuming; opt to machine polish instead if a larger area needs doing.

Many will say that correcting paint is impossible by hand, but this is not the case. It is certainly a more difficult process than by machine, but it is not impossible to remove paint by hand using appropriate pads and polishes (heavy cut polishes for use by hand are sometimes referred to as ‘rubbing compounds’, but other polishes can, of course, be used). Remember that diminishing abrasives may require a long working time to ensure that they have broken down properly, or secondary marring may result.

Working by hand, you will have to exert considerable effort to get the abrasives to cut into the paintwork. This process is easier for softer paints, but on harder paints it may feel as if you are making slow progress. A machine polisher will always be an alternative, but with the correct pad and polish, a little more pressure and plenty of patience, satisfactory results can be achieved with most paint types by hand. Just ensure that you work a small area at a time – perhaps no more than a 40 × 40cm square – and concentrate on just one panel per detailing session.

You will need the following:

- A polish applicator, polishing pad or cloth (coarser textures will exact more cut, soft materials should be used for a fine cut or final finishing)
- A polish of suitable cut for the defect/paint type
- A soft buffing cloth

Seven-Step Method

1. Choose a small working area, approximately 40 × 40cm (possibly a less conspicuous test area).
2. Spread the polish over the area with light pressure.
3. Work the polish into the paint using firm pressure, working backwards and forwards across your small working area. Using straight lines for application will help to ensure even pressure and a more consistent cut. (It makes no odds in terms of avoiding swirl marks.)
4. Work the polish until its residue goes clear, and/or the defects are removed from the finish. How a polish breaks down

depends on its individual characteristics, but diminishing abrasives should be more obvious in how they are being worked.

5. Once the residue has gone clear or has otherwise reached the end of its working time, reduce your application pressure and go over the area a few more times to refine the finish and remove any secondary marring induced during the cutting process.
6. Buff the panel with a soft cloth and assess the results that you have achieved. To gauge ‘true correction’ you may need to use a solvent wipe-down to establish the actual cut achieved. Then decide whether you need to repeat the polishing process or change the aggression of your pad and polish. If the current pad and polish combination is leaving secondary marring you may need to ‘finish down’ with a gentler pad and polish combination after the cutting stage is complete.
7. Once the right procedure has been established for correcting the paint by hand on the initial/test area, it can be replicated over the rest of the panel or vehicle.

Note that the rest of the car should be corrected entirely with a particular polish/pad combination before moving on to the next stage, otherwise there will be too much risk of contaminating fully refined panels with harsher abrasives when polishing neighbouring panels.

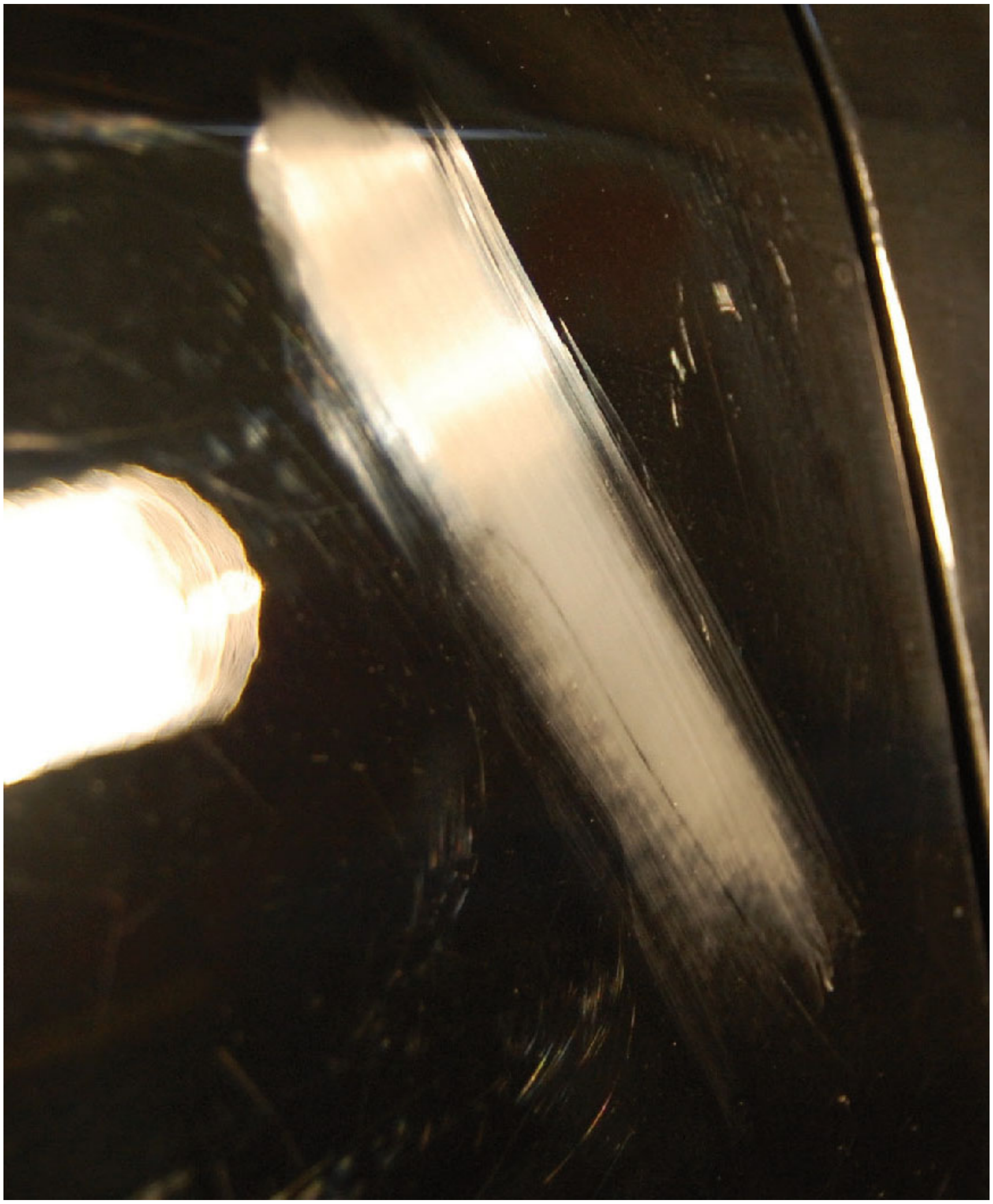
‘IT’LL T-CUT OUT. . .’

One of the most famous scratch removers of all time, but use it carefully: its aggression can catch out the unwary.

T-Cut is probably the most famous hand-applied polish, made under the Carplan brand by UK manufacturer Tetrasyl (hence the ‘T-Cut’ name). Its ubiquitousness in the mass market has led to it entering popular folklore in the capacity of fixing any dent or scratch, no matter how severe! The reality is that whilst it may not repair a heavily dented and damaged panel, it can be very effective at removing many types of scratch by hand, but it is an aggressive polish and will also remove paint from the area around the scratch – and injudicious use could result in strike-through –

permanent paint damage when the paint layer is breached. As with any heavy cut polish, use T-Cut with caution, follow the manufacturer's instructions, and always test on a salvage yard panel or inconspicuous area first (not so easy if it is a specific scratch you wish to minimize or remove). Making slower, steadier progress with a gentler compound may be a more prudent route than 'wading in' with a heavy cut polish, because this reduces the risk of strikethrough despite requiring more time/patience.

PAINT REMOVAL BY HAND: HEAVY DEFECTS USING WET SANDING



Wet sanding removes a lot of paint quickly, but the resulting finish will be matt and possibly full of sanding marks, and will therefore require subsequent polishing.

More serious paint defects such as deep scratches, etching and ‘orange peel’ will take substantial time and effort to remove by hand if using a polish applicator and polish. However, the employment of sanding paper will speed up the paint removal process to such a degree that there will be a considerable risk of permanent paint damage caused by strike-through or deep scratches (‘tracers’), which may prove difficult to remove subsequently. Therefore wet sanding (or ‘colour sanding’) the paint should only be undertaken if, firstly, the detailer has acknowledged the risks of permanent paint damage and accepted them; and secondly, has at least a rudimentary understanding of the process.

Like paint removal by hand using polishes, correction by sanding removes thin layers of paint, but does so far more aggressively: more paint is removed, more quickly.

You will need the following:

- Sanding paper of the correct grade: note that this isn’t DIY store-specification sandpaper of a very coarse nature, as that would ruin car paint irreversibly within moments, but very fine ‘wet-and-dry’ paper typically of P1500 to P3000 grade; never use coarser than P2000 or P2500 if attempting wet sanding on a car for the first time
- A sanding block (optional)
- A water blade or squeegee
- Clay lubricant in a spray bottle
- A bucket of clean water
- A plastic jug or cup, or high dose/high capacity water spray

Thirteen-Step Method

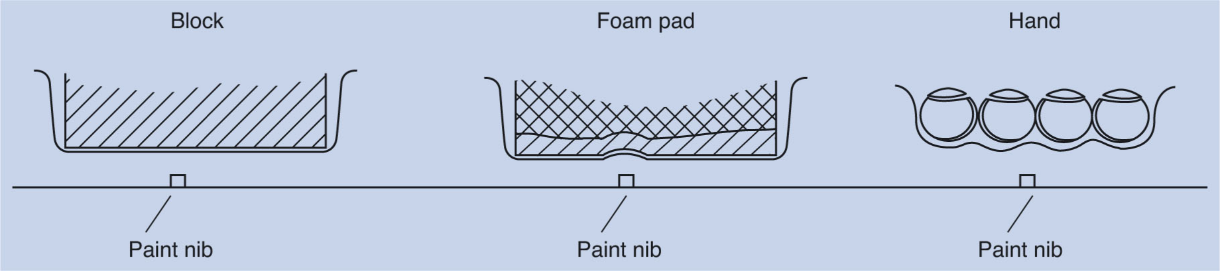
1. Choose whether to use the sanding block with the sanding paper, or just sanding paper on its own: a block will provide a more consistent cut across the surface, but it may dig in if not kept perfectly flat, and you can’t feel any contamination caught under the paper (this could cause a deep gouge, or ‘tracer’, if dragged across the paint surface).
2. Choose the sanding paper or sanding disc of the correct grade – it is best to start with a finer grade than a coarser grade (paint is easier to remove than put back!).
3. Ensure the paper or disc is wet. It doesn’t need to have been left to soak overnight, but it should be wet.
4. Cut off a strip of paper (do not tear it as this causes uneven edges) and fold it around the block, or pinch it between your forefinger and thumb and hold it flat to the paint surface with your fingertips – be careful if you fold the paper as this could

cause it to split at the fold, creating a sharp and jagged edge that may dig into the paint.

5. Ensure the paint surface is clean and has been clayed (*see* earlier in this book).
6. Wet the panel and spray clay lubricant on to the paint surface.
7. Move the sanding paper over the surface with light pressure, listening out for any abnormal scraping noises, which may indicate trapped dirt (stop immediately if you hear or feel that a particle of grit has been trapped beneath the paper, as this will gouge paint deeply).
8. Use straight lines for consistency of pressure, and tackle a small area until you are confident of your ability and the suitability of the paper and technique.
9. If you are trying to remove a scratch, work across it rather than along its length. This helps round off the jagged edges and enhances the appearance more swiftly. And always use a block if you are ‘flattening’ raised paint defects, such as stone-chip paint mounds.
10. Sluice water over the panel during and after the cutting process – the aim is to remove the powdered paint (clearcoat paint will look like a white dust), grit particles from the paper and any grains of dirt that may have accidentally contaminated the surface.
11. Use the water blade or squeegee to clean water from the panel. The sanded surface should be matt in finish with no irregularities, although the type and amount of controlled marring will depend on the sanding paper or pad used.
12. If more cut is required, repeat steps 6–11, replacing the paper when it becomes clogged. You may also consider switching to a sanding paper or pad of heavier cut.
13. To finish, you could use a sanding paper or pad of finer grade, or go straight to a polishing stage (by hand or machine). It is recommended to machine polish if refining a P1500–P2500-grit sanded surface, and to only consider hand polishing if refining a P3000–P4000-grit sanded surface. Note that a solvent wipedown of the panel must be carried out after polishing a wet sanded surface due to the likelihood of oils ‘filling’ the matt

finish and giving it a glossier appearance than it would normally and permanently exhibit.

PAINT REMOVAL BY MACHINE: THE ORBITAL POLISHER

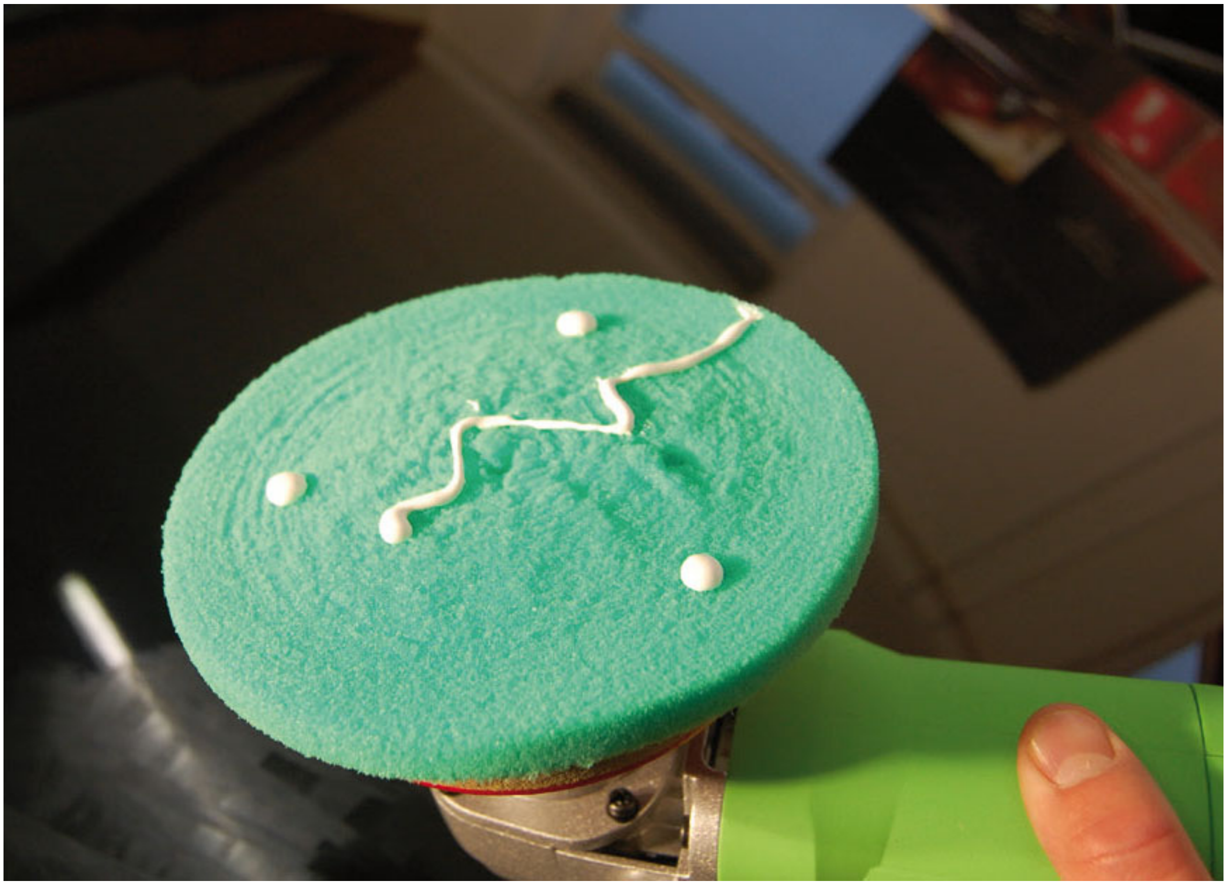


Removing a raised defect by block sanding, versus by foam-backed pad, versus by hand.

Using a machine polisher makes the task of removing paint much easier than working by hand, since electricity (or air in some cases) is doing most of the hard work. One of the types of machine that can be used for the removal of paint is an orbital polisher (described above). In common with removing paint by hand, the correct choice of pad and polish is essential in order to achieve the best results, but the action of a machine throws up many more variables that affect cut. These have been mentioned earlier in the chapter (pressure, number of passes, speed of passes) so it is advisable to refamiliarize yourself with these before looking at the process in more detail.

Contrary to a rotary polisher that has a certain 'pull' or 'drag' across the paintwork when switched on, an orbital polisher will need to be 'driven' or pulled/pushed along – it has little or no inclination to move by itself. For beginners this makes the machine easier to control because it goes exactly where you put it, and it won't move unless you do.

Dosing the Pad



Use a little more polish than normal when dosing the pad for the first set.

Before you start using the machine polisher, it is important to dose the polishing pad. Initially use more polish than you would for a typical set – usually a long line of polish about two-thirds of the width of the pad, and a couple of pea-sized beads on each side. Thereafter, for every set use just a couple of pea-sized beads of polish on the pad. Take care not to overload the pad with polish – if it becomes caked with dried and unworked polish, spur it with a stiffbristled brush, spurring tool or blunt knife, and use less polish in the following sets.

Never ‘dry buff’: an unlubricated pad devoid of polish will swiftly create excessive panel temperatures, scorching paint (which will eventually lead to blistering and bubbling) and possibly leading to ‘strike-through’ (a breach of the paint layer). Smoke may even be seen in some instances.

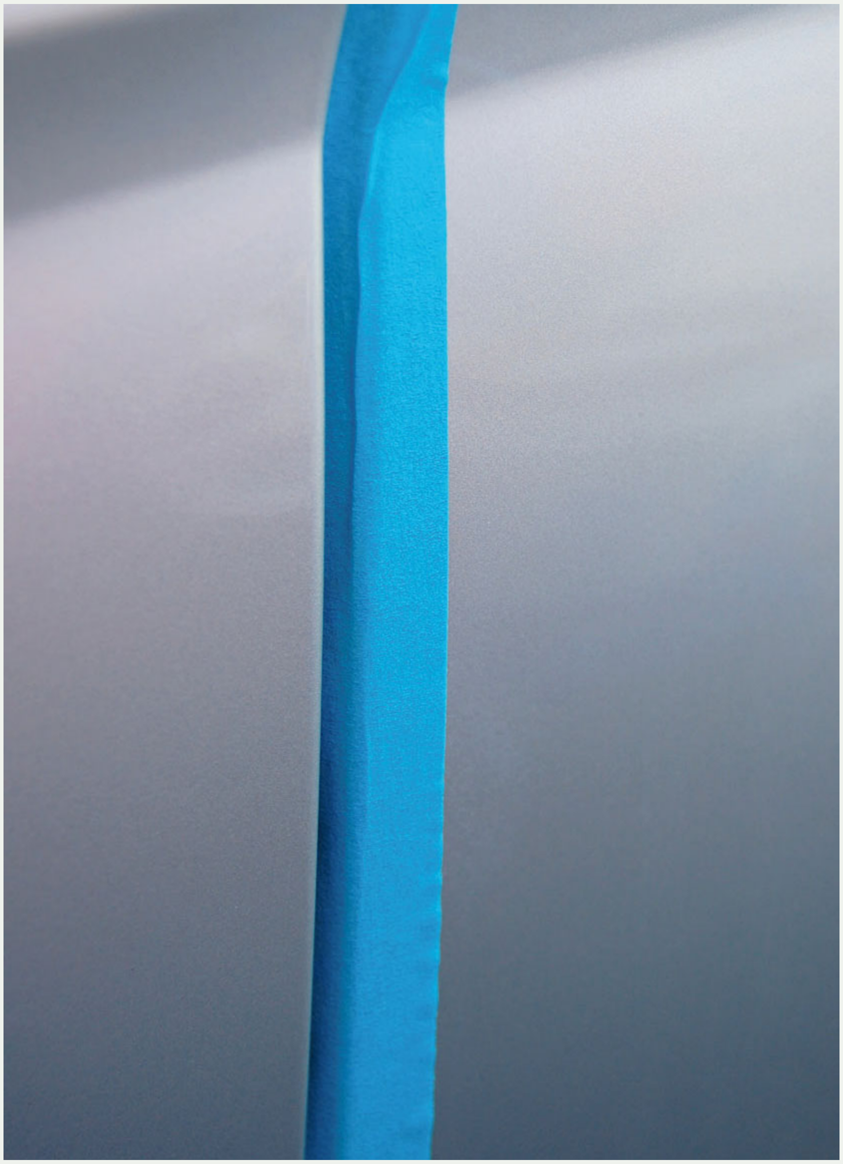
MASKING UP: HOW PAPER PROTECTS

Masking requires patience, but it is a safer and cleaner way to work.

When polishing a car, especially by machine, there will be areas that need masking up or covering to prevent the polish abrading or staining them. These include the following:

- Plastic trim, especially textured trim, which may be either damaged by the polishing process or become covered in unsightly white polish/polish residue
- Rubber trim, which may be either damaged/stained by the polishing process, but could even transfer rubber on to polishing pads in the form of black marks if contact is made
- Badges, windscreen washer nozzles and other protrusions that the machine polisher may inadvertently touch in operation

- Panel edges, where the point pressure from the pad is immense (and strike-through therefore more likely)
- Panel gaps (sometimes masked at the same time as panel edges): polish dust/residue can easily drop into panel gaps and prove difficult to remove subsequently (as well as being unsightly)
- Soft-top (fabric) convertible roofs, where splatter/sling from polishing compounds may be difficult to remove, or even discolour/stain the fabric



Trapping the masking tape in a door edge minimizes the masked area, whilst protecting the paint where it is at its most vulnerable (the edge

acts against the motion of the machine polisher).

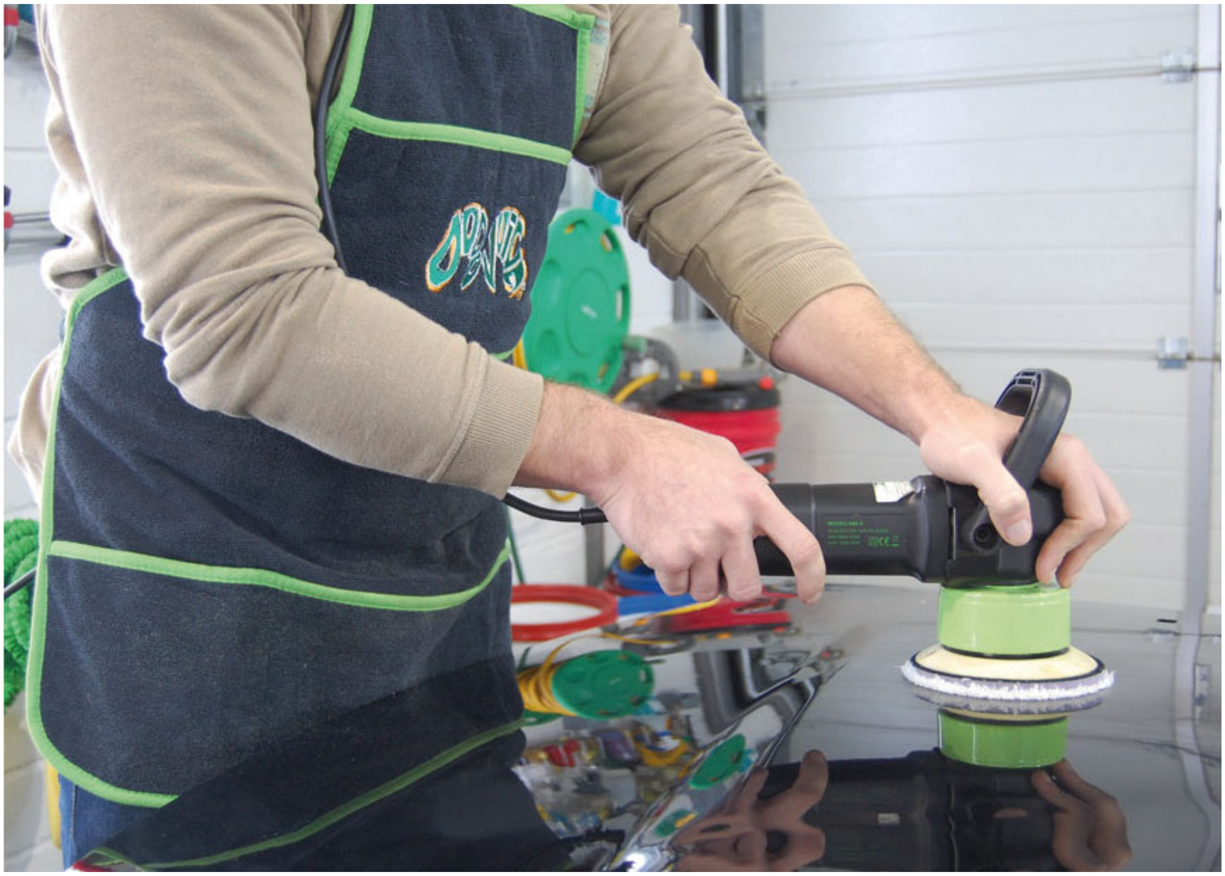
Masking large areas such as the windscreen, wheels/tyres and grilles is best done with sheets of plastic film or brown paper. It is more critical to mask the car when dealing with heavier cut compounds. Gentler polishes may be more easily removed and cause less collateral damage if they splatter on to surrounding areas.

To mask up a chosen area, use a low-tack waterbased adhesive masking tape (the 3M blue tape is a popular choice), and try not to cover too much paint, especially on edges. This will simply result in obvious uncorrected strips of paint that will need fiddly hand polishing to make good. Remember, though, that there needs to be enough overlap and subsequent adhesion to stop the masking tape edge from lifting – if it does lift, the adhesive will be caught and smeared by the polishing pad (you will then need to stop polishing, use solvent or panelwipe to remove the residue, then re-mask).

One trick when masking up is to trap the tape in door/panel shuts and then to polish ‘towards’ it: the tape protects the incoming edge, and the trailing edge is subject to minimal cut and can be left unmasked. It is also worth repositioning the tape, depending on which side of a panel gap is being machined. The tape should lift off easily after the first sets, and repositioning it can mean a much better result than simply masking down the middle of the gap.

Finally, never, ever leave masking tape on paint for long periods of time, especially if it gets wet, as it can weld itself on like superglue.

Caution should also be exercised on softer (or freshly cured) paints and more delicate finishes (for instance, painted trim pieces), as it is not uncommon for paint to lift in these circumstances.



Keep an orbital machine flat to the panel, with the cable out of the way. A relaxed posture with a straight back will help reduce back strain.

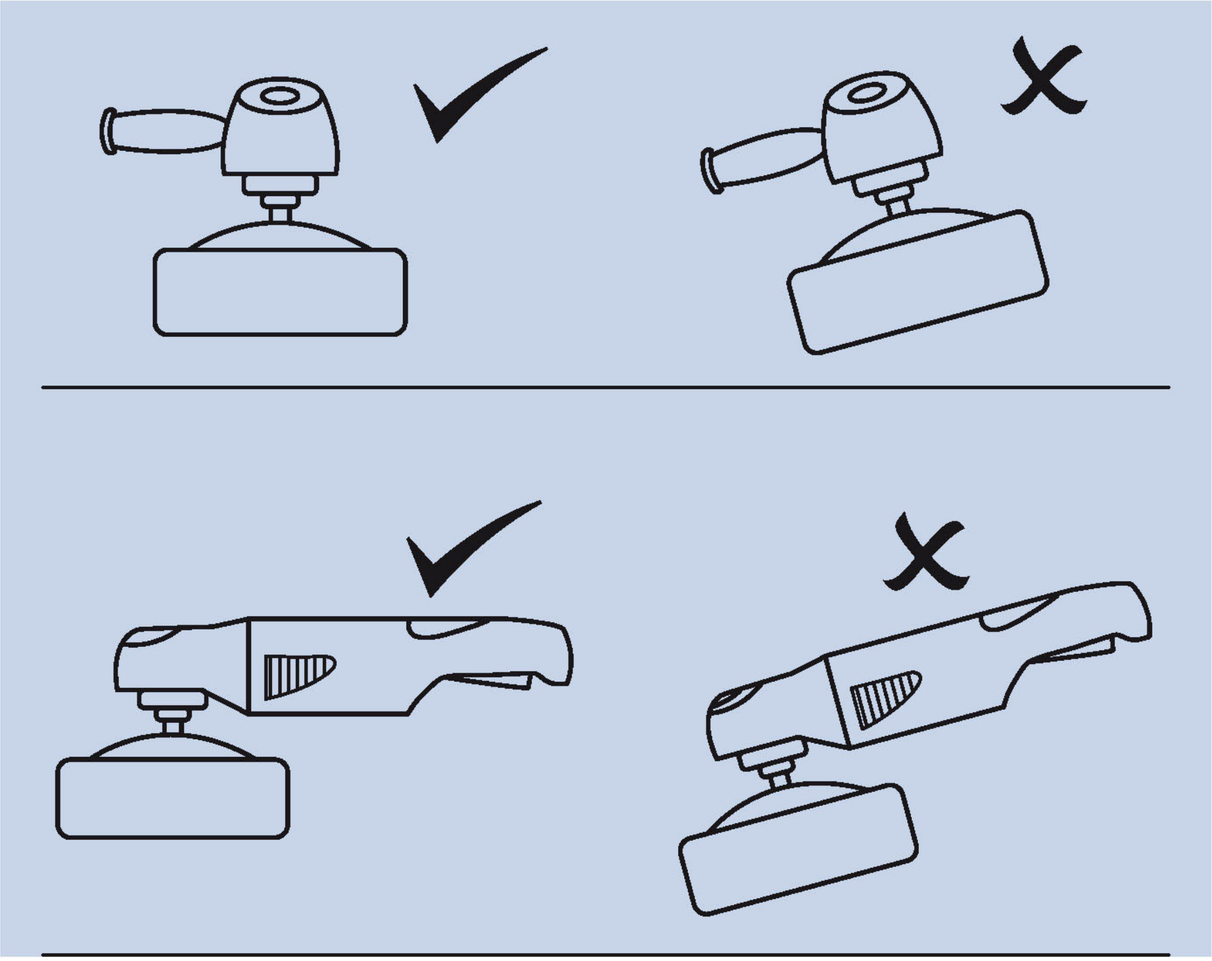
Holding the Machine

Different people will hold machine polishers in slightly different ways, and there is no specific 'right' or 'wrong' way to do so. The most important thing is that you are comfortable holding the machine and are free to move it safely across all the areas that you want to work. Typically, you would hold the rear handle or casing of the machine with your dominant hand (the hand that you write with). The other hand should then be placed on the side or D-handle, or over/around the front gear casing ('head') of the machine. Your back arm is used to 'drive', manoeuvre and help balance the polisher, while your 'front' or 'forward' hand works directly over the gear head and pad, controlling the pressure applied. When putting your hand around the head of the machine, take care not to catch your fingers in the moving parts of the machine, and be aware that it may get hot during operation if uninsulated (most orbitals will have a plastic cover over the metal gear head to prevent heat transfer).

Ensure that when you apply pressure, the pad is kept completely flat on the paintwork. The rear ‘driving’ hand is important for keeping the pad level from front to back – that is, level along the vertical axis and not tilted forward or back – and the forward hand has a role in keeping the machine level horizontally – that is, stopping it from dropping too far on the left- or right-hand side. Unlike rotary machines, orbital machines are not angled during operation because the eccentric orbit would cause the pad to dig in and potentially create ‘pig tail’ marring.

Finally, ensure that the cable of the machine is kept out of the way, passing over a shoulder; this prevents it distracting the user or interfering with the operation of the machine on the panel. This may not be possible if machining vertical surfaces, so just ensure that the cable does not touch the panel, and alter hand positioning as required; kneeling, sitting or even lying on your side may all become necessary. You should ultimately be comfortable and relaxed, as well as making sure that the machine is making contact with the panel effectively.

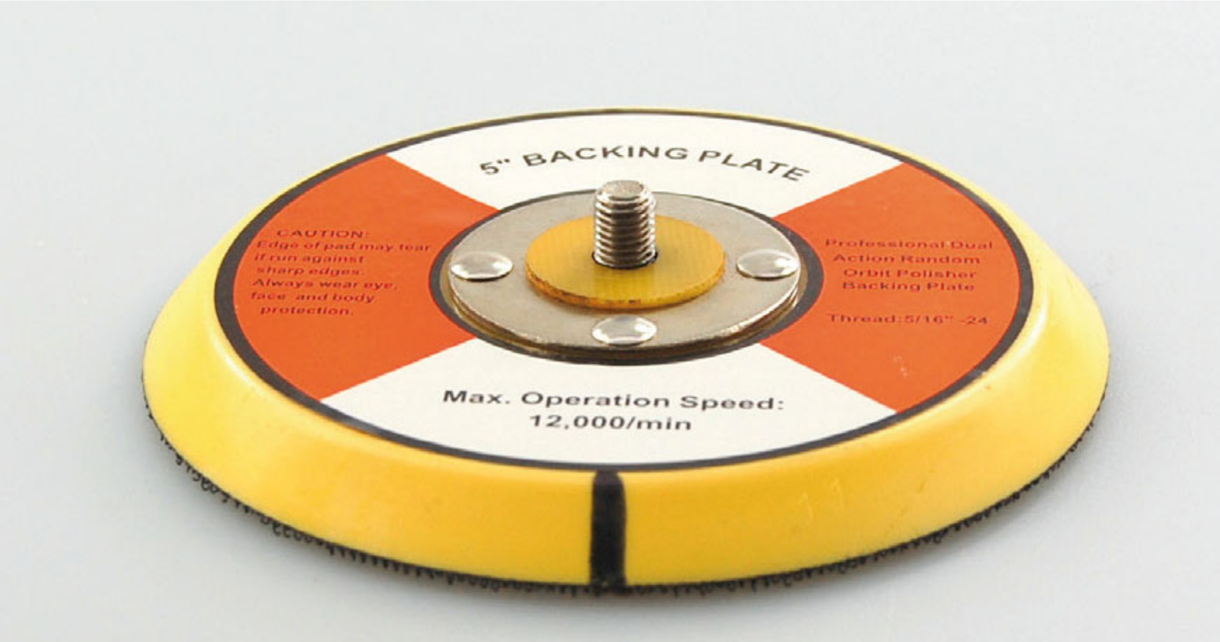
Driving the Machine



Machine handling: vertical and horizontal axes.

When using polishes to cut back the paintwork it is essential that you give the machine appropriate time to work the abrasives. As an orbital polisher is a relatively gentle machine, it should be moved at slow speed across the panel – approximately 3–5cm per second. This allows the abrasives not only to have an effect on the panel, but it also allows diminishing abrasives to go through their required ‘cycle’ and break down effectively. This ensures the best possible finish and the least chance of secondary marring.

During a pass, it doesn’t matter what pattern the machine polisher moves in, whether side to side, up and down, figures of eight, or a combination of all of these. The essential point is that you cover the paint area evenly and completely, allowing for a little overlap.



Marking the backing plate of a clutched orbital machine is a good way to judge how much pressure you should be applying to the panel during the polishing process.

Different polishes require a different amount of pressure in order to work effectively, and it is important to experiment to see which pressures deliver the best results on the paintwork that you are working on. The typical pressure to apply is around 5–6kg – about twice the weight of a machine polisher. So if the machine is applying 2–3kg in itself, and you apply the same pressure again, then this will be about right; you can get an even more accurate idea of how this feels by pushing the machine down on a pair of scales. However, exact pressure is not essential and if you are using a clutched orbital machine, there is a much simpler guide to pressure and polishing effectiveness: the rotation of the pad. Note that this works *only* for clutched orbital polishers where the backing plate has an element of free movement. Simply mark the backing plate with a permanent marker, then apply enough pressure during polishing for the backing plate to rotate at approximately one to two 'optical' revolutions per second.

As you press down to achieve this optimum rate of rotation, you will hear the tone of the machine's motor change slightly; however, it should never sound as if it is struggling. If the pad rotates slightly faster than this, it is not a problem, especially at higher speeds, but it should not be ‘buzzing around’ as if it is out of control, because this means it is barely touching the paint surface and the cut will therefore be minimal. And if the pad stops rotating, this means you are applying too much pressure, and again, there will be little or no cut if this occurs: therefore reduce the pressure until the pad begins to spin. Pay particular attention to this when working near edges and contours, as these can be pressure points that will cause the pad to stop spinning.

The ‘Polishing Set’

Typically, we talk of a full application of a polish – from spreading, through to working and then refining – as a ‘polishing set’. This will comprise a number of passes, perhaps one to two to spread, three to four when working, and then two to three to refine. Different products will require different polishing sets, with different combinations of passes, to get the best from them, and it requires experience and practice to see what will work best for you and the products that you are using.

The typical steps of a general polishing set by orbital polisher are described below. This combination of passes is sometimes referred to as the ‘zenith’ technique due to the fact the passes start out gently and then ramp up in terms of frequency before finishing less aggressively. The zenith is the highest point of cut, mid set.

Spreading: Start off at a slow speed and move the machine quickly across the area with light pressure to spread out the polish: one to two passes.

Working stage 1: Begin working the abrasives to achieve correction by stepping the machine up to medium speed. Slow the pass rate of the machine – the movement of the machine across the panel – to 3–5cm per second, using the appropriate pressure: three to four passes.

Working stage 2: As stage 1 above, only with the machine at medium-high to high speed. Don’t be tempted to speed up the pass rate/machine movement – keep it slow and steady and watch your pressure! If working a diminishing polish, keep going until the residue goes clear: three to four passes.

Refining (optional): Non-diminishing polishes rarely require refining passes, but there may be an advantage to a refining stage if using a diminishing polish. In these circumstances, reduce the machine speed and polishing pressure for a few passes at the end of the set to refine the finish: two to three passes.

You will need the following:

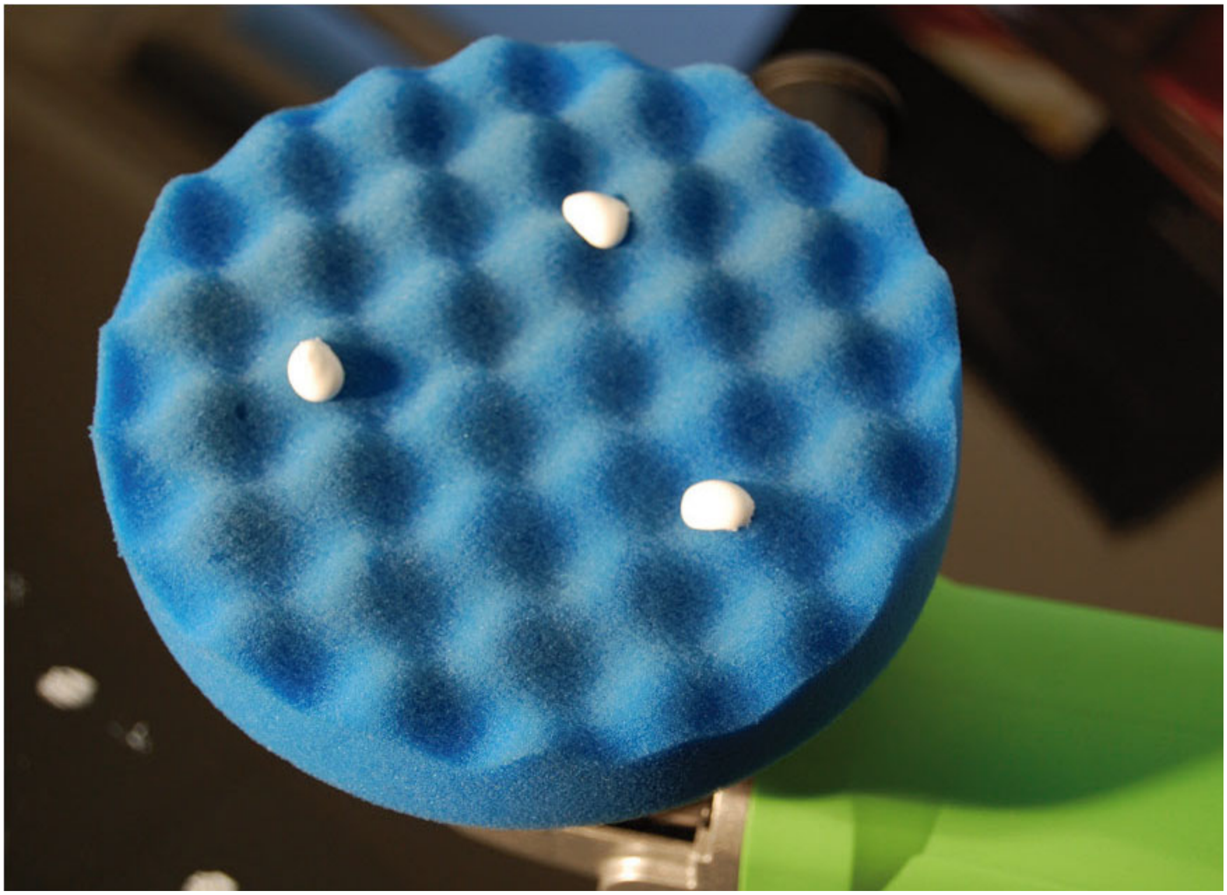
- An orbital machine polisher
- A suitable backing plate
- The requisite pad for the polishing stage (always start with a lighter cut if unsure)
- A suitable polish
- Pad prime (optional, *see* text box)
- A soft microfibre cloth for buffing

Nine-Step Method

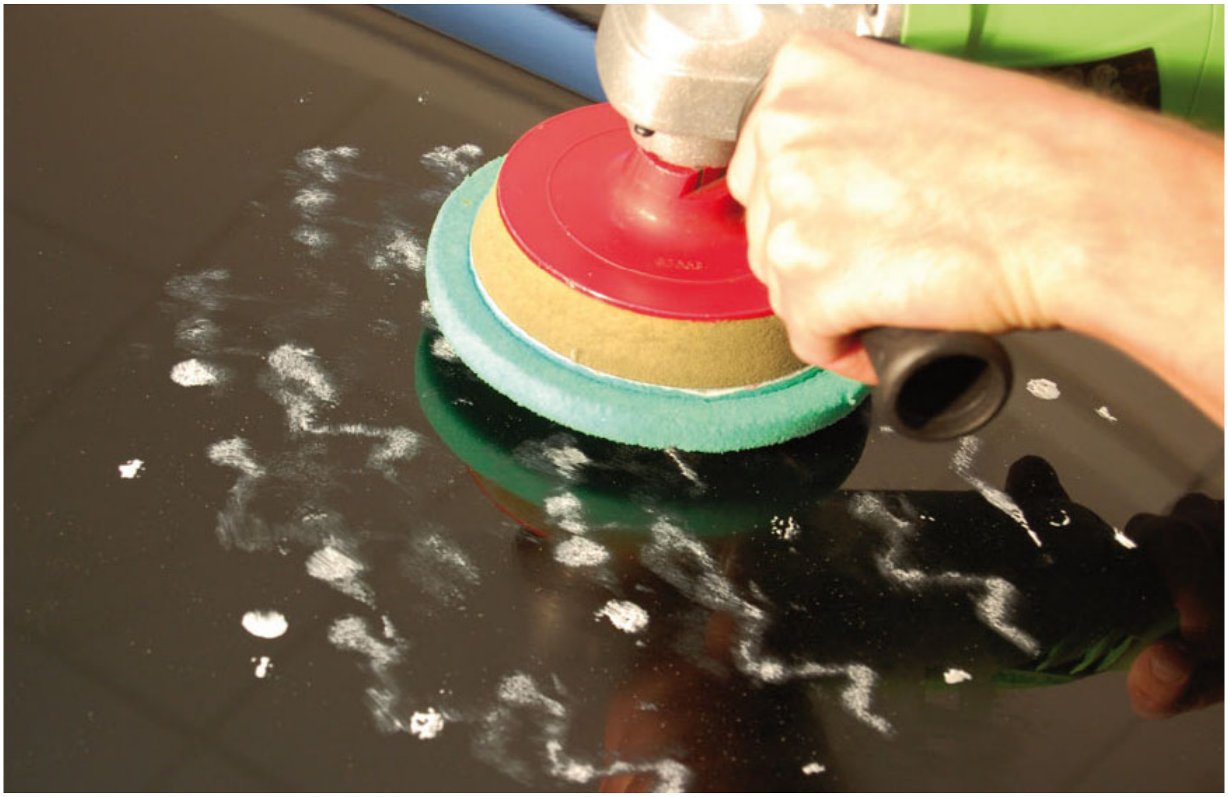
1. Take paint thickness readings if necessary, to check that the panel is suitable for machine polishing, then use masking tape to mask the area (*see* text box above).
2. Establish your working area, approximately 40–60cm square, depending on what feels comfortable (you want to be able to reach all the edges comfortably, without straining). Remember that you should tackle a less conspicuous test area first, if you are not sure how the paint will react (you may need to panel wipe it afterwards, to see the true cut achieved). Start on upper panels and work your way down, to limit splatter/sling on to areas that have already been polished.
3. Check that backing plate, pad and polish are all suitable for the amount of paint correction required.
4. Dose the pad with a few pea-sized beads, or apply a heavier amount of polish if using a microfibre pad (don’t saturate it completely, as this may reduce the effectiveness of the pad).
5. Ensure that the power cable for the polisher is over your shoulder and not going to interfere with the polishing process,

or distract you.

6. Spread polish over the working area, typically by touching the loaded pad on to the panel a number of times – this leaves a number of small mounds of polish behind, courtesy of the raised beads.
7. Start the polisher on the panel: this reduces sling/splatter and also prevents the pads from being damaged by the eccentric throw of the machine (which could lead to shorter pad life).
8. Initiate the polishing set (*see* above). Start by spreading the polish, then work it at higher pressures: keep adjusting the speed/power of the machine to ensure that the pad revolves at an ‘optical’ one to two revolutions per second. Ensure the pass rate (the movement of the machine) is slow and steady – don’t rush through the set, which would be ultimately self-defeating as less cut will be exacted on the panel.
9. Once the set is complete, stop the machine on the panel (again, this is to prevent unduly stressing the polishing pad, and to minimize splatter). Buff off the residue with a folded, soft cloth and inspect the panel. If obvious further correction is needed, undertake further sets (perhaps varying pad or polish to regulate cut). Clean or ‘spur’ the pad if necessary, before continuing with the same pad/polish combination; pads lose cut when clogged with polish/paint residue (a blunt knife or air nozzle may work if you don’t have access to a proper pad spur).



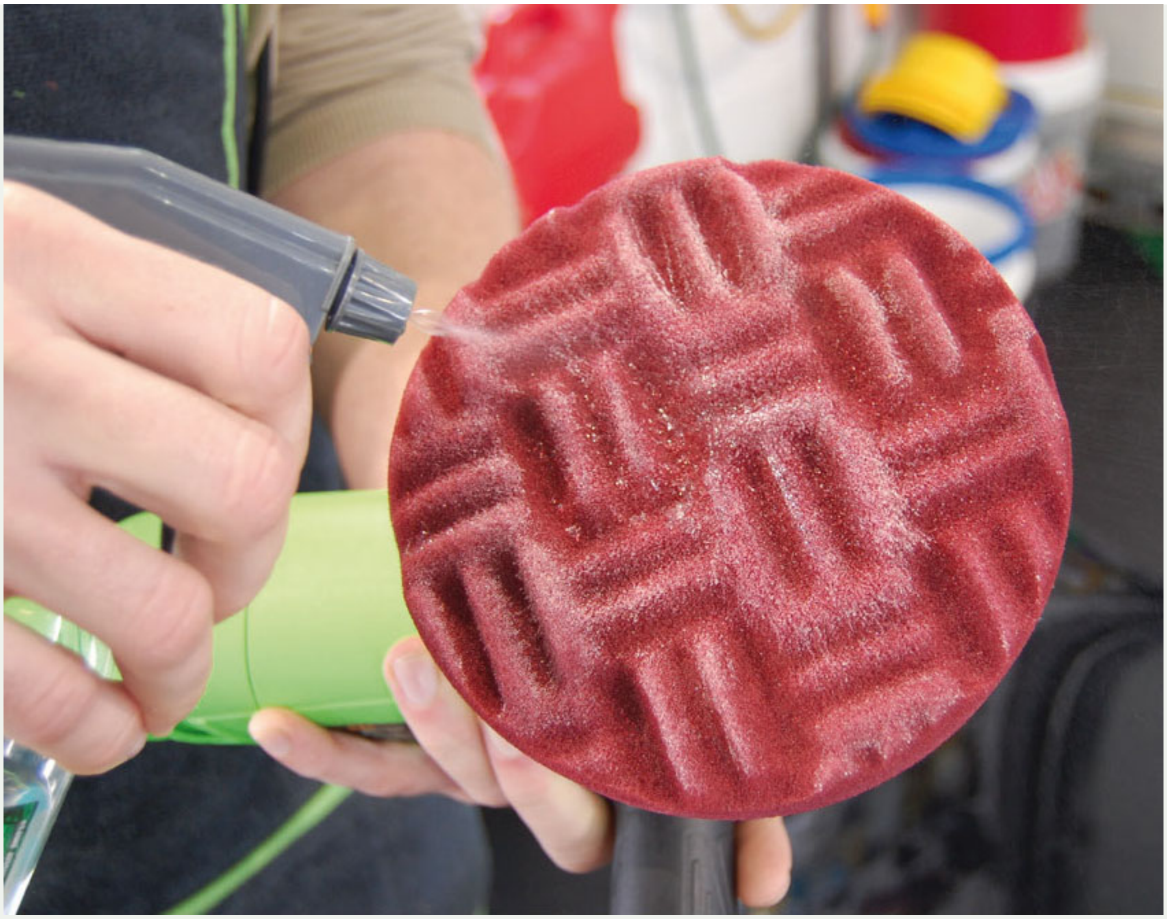
Typically, a pad is dosed with a few pea-sized blobs.



Spread polish on the panel using a dabbing or smearing technique – either is fine.

If it looks as if the paint has been fully corrected, then consider a solvent wipedown of the panel to measure true correction (*see* text box:).

PRIMING THE POLISHING PAD: IS IT NECESSARY?



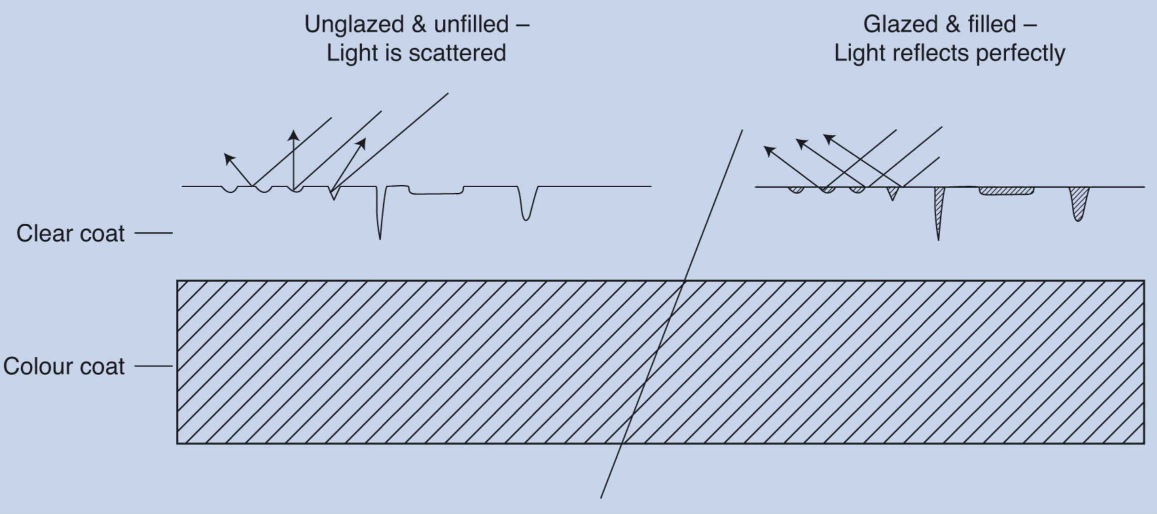
Water may interfere with the lubricants in polishing compounds, altering the anticipated amount of cut.

Some detailers like to ‘prime’ the polishing pad with a quick detail spray, clay lube or dedicated pad prime before starting to polish. The idea is that the polishing pad is ‘dry’ until it becomes soaked in polish and starts self-lubricating. Whilst using pad prime may do no harm if it does not interfere with the polish, there are some points to note.

Firstly, it may reduce cut or lengthen the working cycle of a diminishing polish, which could be detrimental to the paint correction process. Secondly, pads are designed to cut via friction and, unlike clays, do not need additional lubrication (beyond polish) for them to work; indeed extra lubrication may simply lower panel temperatures and cut. So using pad prime is, strictly speaking, unnecessary. The only times when pad prime could be considered necessary is when working on very soft or UV-damaged paint, where the paint is more absorbent and there is also a higher chance of secondary marring from the pad or polish; or if the polish is extremely dry or under-lubricated and needs a longer working time for successful application.

Note that water (on its own) is never recommended as a pad prime, because it can dilute the lubricants within polishes, increasing the chance of marring and decreasing polish workability/working times. Whilst a little water could lead to high pad temperatures and the risk of burning paint, too much water added to the pad or panel surface may conversely lead to hydroplaning of the pad, eliminating cut entirely.

PANEL WIPEDOWN: THE PATH TO TRUE CORRECTION



Glazes within polishes can fill defects. Remove them with solvents to see the 'true cut' achieved.

A solvent wipedown can reveal the true nature of the paint finish. The aim of this process is to remove glaze oils, resins and waxes that may be hiding or 'filling' defects. Because some of these may be carried in the polish compound itself, it is important to do a solvent wipedown after machine polishing if you want to see whether you have achieved true correction of the paint. Whilst a strong isopropyl alcohol (IPA) solution or domestic solvents (such as white spirit or turpentine substitute) may suffice, bodyshop panelwipe is far more effective.

Note that care should be taken when using strong solvents on delicate finishes as they could damage soft paint or SMART repairs. IPA can be used at anything from 1:10 dilution with water, to neat. There will always be a compromise between the effectiveness of a panel wipedown and its safety margin: aggressive solvents remove more filling residues, but can attack the underlying finish more readily. Likewise, mild solvent sprays (for example, certain glass cleaners) may be safe on all finishes but could fail to remove stubborn paint sealants.

PAINT REMOVAL BY MACHINE: THE ROTARY POLISHER

Compared to dual-action polishers, there is a huge number and selection of rotary polishers on the market. Once the preserve of bodyshops and experienced professionals, the rotary polisher is now becoming much more common as a paint correction tool for detailing enthusiasts looking to take their car’s paint to the next level. Given the variety of machines available, choosing the right one can be a challenging task. Speed ranges, machine weights, switch and control positions, general ergonomics and specifications can all vary widely across the board. The easiest way to come to a decision is very similar to choosing the best car for your needs: do your research, canvas the opinion of friends, and finally ‘test drive’ as many machines as you can. However, there are certain features that are recommended for rotary machines used for detailing, so always bear these in mind when making your choice:

Electrical operation: Air-powered tools will be unsuitable for most detailers.

Variable speed: Choose a machine with a range of at least 1,000–2,000rpm, ideally 600–2,500rpm. A greater speed range will give you flexibility (slower speeds tend to be more useful for finishing and refining, with higher speeds better suited to aggressive cutting) and ensure that you get the best from your polish/pad combination.

Electronic speed control: This will maintain constant pad speed regardless of pressure, and supply enough power and torque to prevent the machine from ‘bogging down’ (this really needs testing on an actual panel with the machine, due to the nature of gearing and the difficulty in corroborating stated power outputs).

Comfortable ergonomics: Look for a pleasing trigger action and a ‘permanent on’ switch or trigger lock (if desired) so that the trigger does not need to be kept depressed constantly.

Weight to suit user and requirements: For heavier cutting, a heavier machine may actually help keep pad pressure high – although most detailers will prefer a lighter machine to ease back strain when polishing. Weights tend to be between 2 and 3kg.

Dosing the Pad

Tip the pad to capture fresh polish during the machine-polishing process.

As with the orbital polisher, dose your polishing pad before you begin with a line of polish squeezed on to the pad with a couple of pea-sized beads on either side. Use a little more polish for the first pass to prime the pad, but be wary of pad 'sling' (where polish is thrown off the spinning pad on to nearby surfaces – if a heavy cut compound lands on soft paint nearby it may mark it during removal, especially if it is allowed to dry on).

Remember that you don't always need to stop a rotary to add more polish to the pad. If you have worked your polish fully and need some more applied to the panel, you can squirt some directly on to the panel itself and 'capture it' with your rotary. This takes some skill to do (otherwise sling is inevitable!) but it basically involves tipping the rotary up on the pad's 'nose' by a few degrees and then 'reversing' over the polish mound. Because most rotary polishers spin clockwise, reversing on to the mound of polish from right to left (a reverse direction) captures it and prevents it from being ejected from the panel.

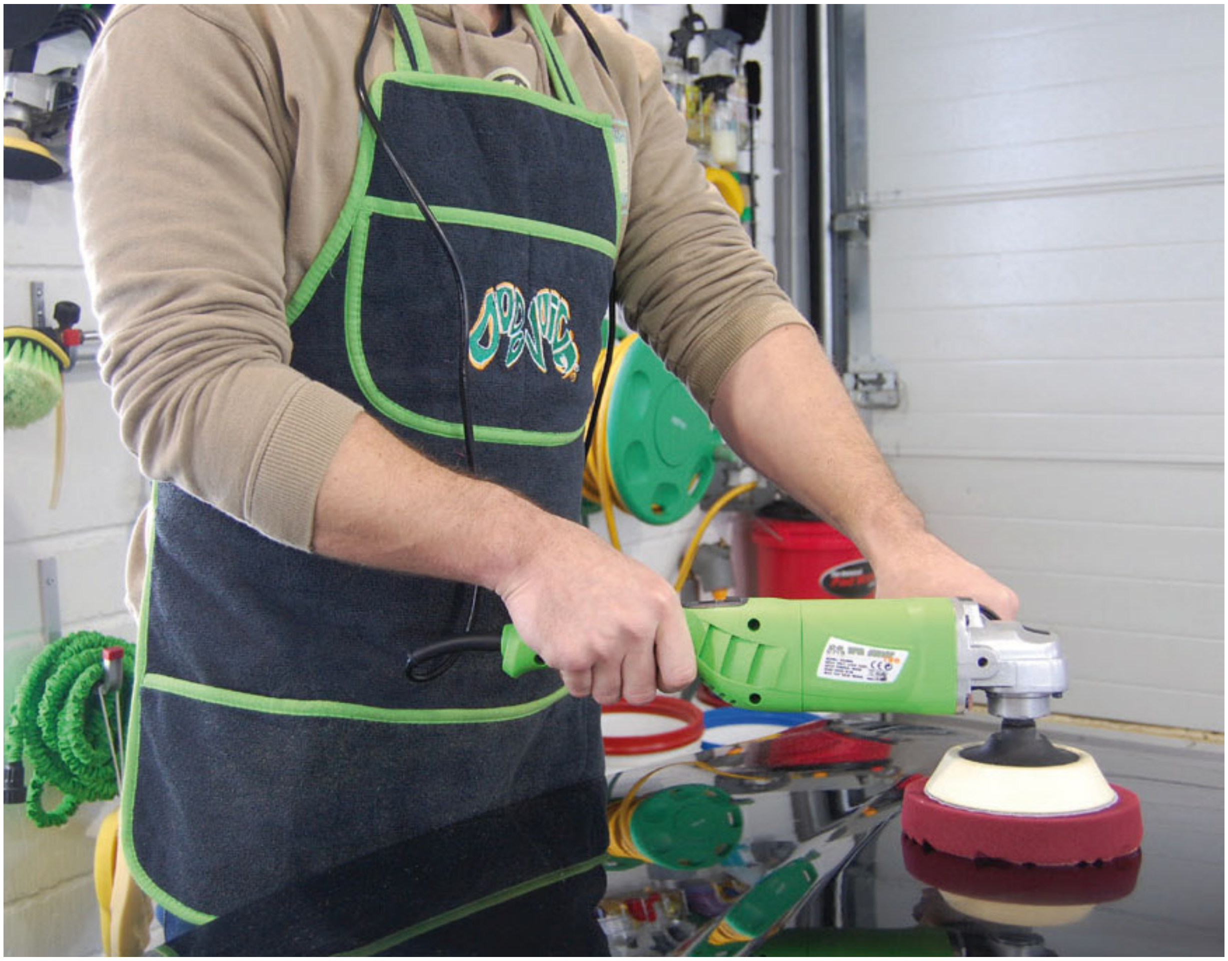
MIXING POLISHING COMPOUNDS: MADNESS OR GENIUS?

It is inevitable that some cross contamination of polishes is going to occur on the pad or panel at some stage. This is usually when stepping ‘up’ or ‘down’ in terms of polishes (to a more or less aggressive polish than the one currently being used), but it could be a deliberate process.

In accidental terms, it is rare that much harm will come to a panel if a ‘used’ pad coated with a medium- or fine-cut compound mixes with a new polish, although it is always best practice to use a fresh pad if at all possible. There could be a marring risk with heavy cut abrasives though, especially if the polish is a non-diminishing type and the paintwork is quite soft. Always clean the pad (typically by running it under a tap and massaging washing-up liquid into the pad face) after using an aggressive compound to avoid this contamination risk.

However, there is an instance when mixing compounds could be beneficial: to create a hybrid compound with the best characteristics of both. For example, the heavy cut of an aggressive compound may be tempered or made more workable by an oilier finishing polish. There is no need to mix these up prior to polishing, of course: they can simply be mixed on the panel by applying a pea-sized bead or two of each polish to the pad.

Holding the Polisher



Whilst rotary machines are often kept flat to the panel, like orbital machines, they may sometimes be angled to focus cut on to a specific area.

A typical rotary polisher is longer than a typical orbital polisher, but the way you hold both types of machine is very similar. Your dominant hand (the hand that you write with) is used to support the rear handle of the machine. This is your ‘drive arm’ and it controls the trigger, speed and movement of the polisher, as well as the vertical axis (keeping the machine level from front to back). Your other hand should be placed on top of, or around, the gear-head area of the machine, or on the side handle or D-handle. This is used to control the pressure applied. If holding the gear casing, keep your fingers away from the spindle and backing plate; note that the gear casing can get very hot during use. When polishing, your ‘forward’ hand will apply additional pressure to the polishing head when required, and will also keep the machine balanced horizontally. With practice, a mere finger on the side handle could be enough to support and guide the machine.

As with an orbital machine, ensure that the cable of the machine is kept out of the way, passing over a shoulder; this prevents it distracting the user or interfering with the operation of the machine on the panel. You may also need to adjust your hand and/or body position when detailing lower panels or other awkward areas; just ensure that you remain comfortable and relaxed, as well as making sure that the pad contacts the panel effectively and that the cable is kept out of the way.

Driving the Polisher

Unlike an orbital polisher that will only move where you want it to go, a rotary polisher will move at its own accord over the paintwork, exerting drag or pull from its clockwise rotation. Because you are holding the end, its natural coverage is an arc. This can be used to great advantage if you remain relaxed (but in control) as the rotary polisher can be made to do most of the work, whilst you simply guide it!

If you are used to using an orbital polisher (many people 'graduate' from this to a rotary), then you really need to forget a lot of what you already know and adjust your technique to the new machine. The rotary will do more work, from cutting paint to physically moving across the panel – so you need to 'flow' with the machine and never fight it. To master this, firstly you need to keep the pad as flat as possible on the paintwork. 'Edging' or angling the pad (where the pad is not flat, but tilted) is a technique that can be used for heavier cutting, but it can cause the rotary polisher to dig in and move quickly and aggressively across the paint, and therefore should be avoided until you are fully confident with the machine.

It is also essential that you are relaxed. Take control of the machine: do not let it control you. Relaxed, flexible arms will allow you to support the machine easily and keep the pad flat as it moves over the contours on a typical car panel. Tightening the arm will mean the pad does not flow over the panels flatly, and this could lead to the machine digging in, bucking, or otherwise going out of control. Keep your back straight as well, by bending your knees and 'sinking' down into a comfortable, upright machinepolishing position. Rotaries can be very heavy and their length makes them particularly tiring to handle, so try to minimize any adverse effects – back ache, for example – by adopting a good stance.

In terms of the speed of passes, different movement rates can be used to get different results from the same pad and polish combination. Slow passes of the polisher, like those used for orbital machines, can be used for focusing the effort on a particular section to get more cut. However, care should be taken not to generate too much heat (rotaries will generate more heat than orbital machines at the pad surface), and slow movements should be avoided around panel edges (especially when coupled with heavy pressure). Conversely, faster movements can be used if a lighter, cooler cut is needed. The best solution is to let the paint tell you – if the panels feel as if they are getting too hot (this is a major consideration on plastic panels such as bumpers, which can't dissipate heat as quickly as metal panels), move the machine faster and reduce the pressure.

Remember that if you are moving the machine faster, it means you will need to make more passes over the same area to get the same result, as you are spending less time on a given area with each pass. However, the approximate length of a set will remain roughly the same – you'll just be doing more 'faster' passes than fewer 'slower' ones.

Unlike an orbital polisher, rotary polishers do not require so much pad pressure during a typical polishing set. The physical weight of the machine may also mean that more pressure is naturally leveraged over the gear head. For normal polishing requirements, the weight of the machine may well be enough, as this could mean 2–3kg acting on the head. If you need more cut, though, then you can increase the pressure or angle the pad. For the refining stages, it is important to decrease the pressure applied in order to reduce any potential cut to a minimum. This gives the best possible finish.

On vertical panels that don't have wide flat areas, such as car doors, flowing 'arc' movements may not be possible. When preparing to tackle a panel like this, examine it carefully and spend a moment planning the most fluid movement across it. Be aware that forcing the machine across contours and edges should be done carefully and can cause a sudden change in direction from the machine. For this reason it is often better to move the machine along contours, effectively flowing along the lines of the panel. Where it is not possible to follow the natural movement of the machine, focus on making steady and gentle guidance movements with your forward arm. Avoid jerky movements and changes of direction where possible, as this can lead to rotary 'hop' or 'skip' in some cases. Whilst a hop or skip will rarely cause paint damage in most instances, the sudden acceleration of the pad could 'burn' delicate paint finishes and should therefore be avoided.

The 'Polishing Set'

Typically we talk of a full application of a polish – from spreading, through to working and then refining – as a 'polishing set'. This will comprise a number of passes, perhaps one to two to spread, three to four when working and then two to three to refine. Different products will require different polishing sets, with different combinations of passes, to get the best from them, and it requires experience and practice to see what will work best for you and the products that you have.

On a rotary polisher, the polishing set can vary widely depending on what you are looking to achieve, and it can also vary between different users. However, the 'zenith' technique is an excellent general polishing method and suits most scenarios. It can then be adapted to suit the task in hand.

The idea of this polishing method is to start at a slow speed and then work up in terms of speed and pressure to the maximum 'zenith' point, where the heaviest cut is being enacted. You then slow the process down again as you refine the finish and approach the end of the set. This final refining stage is particularly important with diminishing abrasives; whilst the abrasives cut the paint, they may also leave behind residual secondary marring, and this can be removed by working the (now finer) abrasive particles gently at the end of the set.

The typical steps of a 'standard' rotary polishing set are therefore as follows:

Spreading: Initial passes at a slow speed (1,000rpm or less), with little or no pressure to spread the polish out across the working area: one to two passes.

Working stage 1: Build the speed towards the zenith point, around 1,500–2,000rpm, increasing the pressure slightly and ensuring the machine is 'fluid' and moving across the panel (two to three passes). This increases temperatures, helping to liquefy the polish and release the lubricating oils within, ready for the next stage.

Working stage 2: Reduce the polishing speed to no more than 1,500rpm, and continue working the polish until the residue goes clear, or for another three to four passes.

Refining stage 1: Once the residue has gone clear, it is essential to refine the finish if you are aiming for the perfect result*. Reduce the working pressure and slow down the hand movement and machine speed for the refining passes: two to three passes.

Refining stage 2: Finish the set with a final couple of light pressure, slow passes at a low machine speed (1,000rpm or so): one to two passes.

* In some cases, when using higher cutting polishes and compounds, it is desirable to stop before fully working the polish. This will result in a poorer overall finish, but this can be refined with a separate finishing polish. This technique is ideal when removing severe marring from paintwork with a high cutting compound that would not finish to a high gloss in any case. Using the compound for its cut only, and refining the finish afterwards with a dedicated finer cut polish, typically results in a better quality finish overall, and may remove less paint from the panel in total.

You will need the following:

- Rotary machine polisher
- A suitable backing plate (M14 thread for European machines, 5⁄8in thread for US machines)

- The requisite pad for the polishing stage (always start with a lighter cut if unsure)
- A suitable polish
- Pad prime (optional – *see* box text above)
- A soft microfibre cloth for buffing

Ten-Step Method

1. Take paint thickness readings, if necessary, to check that the panel is suitable for machine polishing, then use masking tape to mask the area (*see* box text above).
2. Establish your working area, approximately 40–60cm square, depending on what feels comfortable (you want to be able to reach all the edges comfortably, without straining). Remember that a test area on an inconspicuous part of the panel is prudent if you are not sure how the paint will react; rotary polishers can be more aggressive in cut than orbital machines.
3. Check that backing plate, pad and polish are all suitable for the amount of paint correction required.
4. If you will be using a particularly dry polish and/or will be machining at high speeds/panel temperatures, consider using pad prime (*see* box text above). Otherwise this is likely to be unnecessary.
5. Dose the pad with a few pea-sized beads.
6. Ensure that the power cable for the polisher is over your shoulder and is not going to interfere with the polishing process, or distract you.
7. Spread polish over the working area, typically by touching the loaded pad on to the panel a number of times – this leaves behind a number of small mounds of polish, courtesy of the raised beads.
8. Start the polisher on the panel: this reduces sling/splatter.
9. Initiate the polishing set (*see* text section above). Start by spreading the polish, then work it at higher speeds and/or pressures. Ensure the pass rate (movement of the machine) is always controlled, considered and never rushed – rushing

through the set is ultimately self-defeating as less cut will be exacted on the panel.

10. Once the set is complete, reduce the speed to the lowest setting and gently lift the machine off and away from the panel. Buff off the residue with a folded, soft cloth, and inspect the panel. If obvious further correction is needed, undertake further sets (perhaps varying the pad or polish to regulate the cut). Clean or ‘spur’ the pad if necessary, before continuing with the same pad/polish combination; pads lose cut when clogged with polish/paint residue (a blunt knife or air nozzle may work, if you don’t have access to a proper pad spur). If it looks as if the paint has been fully corrected, then consider a solvent wipedown of the panel to measure true correction.

SLOW CUT: A BETTER ALTERNATIVE?

Some detailers won’t increase machine speeds at the working stage, but prefer to increase pad pressure instead. Effectively, it’s the zenith process, but with pressure rather than speed. This is used in combination with ultra-slow passes, to grind the paint down methodically. So after spreading the polish at, say, 800rpm, cut will be undertaken at 1,000–1,200rpm (or less) for maybe six to seven slow passes. The refining stage is then completed, if required, at lower pad pressures.

Is it better? This is difficult to say, but it may certainly suit water-based, heavy cut polishes that would otherwise dry out too quickly if machined at higher speeds and temperatures.

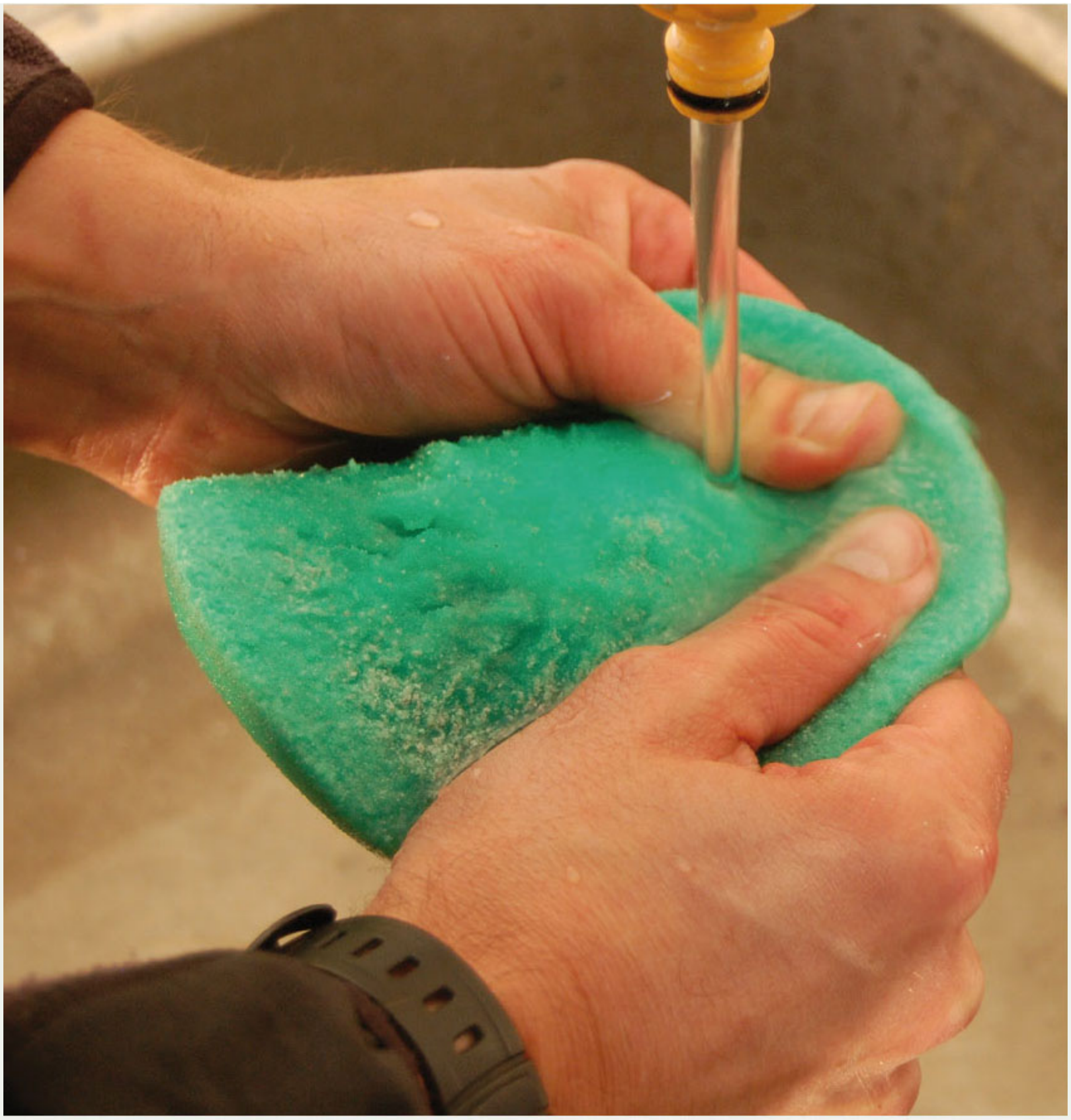
RECTIFYING THE FINISH BY FILLING GLAZE

If defects in the paint are not removed physically by means of cutting them out (perhaps because the paint is too thin), there is still the option to mask them by means of ‘filling’. This is where glaze oils (or similar ingredients within coatings) flow into the microscopic pits, pores and scratches in the surface of the paint, optically smoothing it out and therefore improving refraction and reflection. Don’t confuse a ‘filler’ with a ‘Polyfilla’-style substance or bodyshop filler – nor is it a single ingredient or substance. Fillers comprise a broad class of masking agents, and many detailing products have the capability of filling, from polishes and glazes, to waxes, sealants and even detail sprays. Even water can temporarily fill, as will be seen if you pour it on to an impermeable, lightly sanded surface.

It is essential not to be judgemental about fillers: they can be extremely helpful and should not be vilified. It is only if true correction is being attempted that they can be a hindrance, rather than a help. If they need to be removed, a solvent wipedown, perhaps using a panelwipe, may prove effective.

CLEANING PADS AFTER USE: KEEP YOUR FOAM FRESH

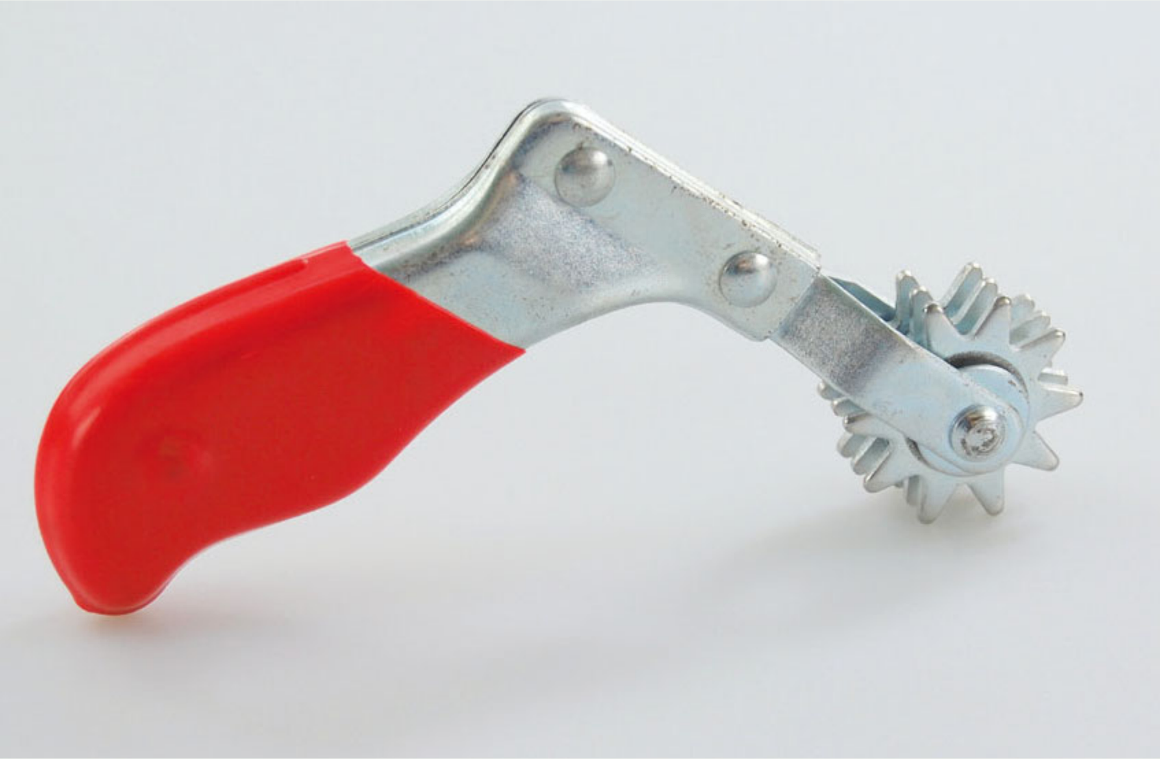
After using a polishing pad (or even during polishing), you’ll want to get rid of the old crusty residue before it gets re-used – unlubricated, ‘dry’ abrasive particles may mar soft paint finishes, especially if the polish was of an aggressive nature. Whilst specific pad-cleaning machines exist (effectively a water-filled bucket with a sprung grate inside, against which the polishing pad is spun by the machine polisher), it is assumed that most pads will be cleaned manually. Here’s a quick guide to manual pad cleaning and maintenance:



Manually cleaning a foam pad using washing-up liquid and a running tap.

Foam pads: To clean a foam pad, run it under a warm tap and squirt a little washing-up liquid on to the face. Using two hands, massage the washing-up detergent into the area that has been stained with polish using your thumbs, and rotate the pad using your fingers in a 'scrunching' action. As the pad rotates through your hands, your thumbs massage detergent into new areas of the pad. Doing this under a running tap should eventually carry away the detergent and contamination, and when the foaming subsides you should end up with a clean (but wet) pad. Rinse it thoroughly with water and then leave it to air dry, or wrap it in an absorbent microfibre drying towel to speed up the process.

If you need to clean an excess of residue from the foam pad during a polishing set, you can use a pad spur or (blunt) knife. With a rotary polisher, you can run it at low speeds and scrape the polish off (like a 'potter's wheel'), but always ensure the spurring tool you are using is gentle enough for the type of pad you have. Foams can be relatively delicate and could shred or break up if aggressively spurred. Never soak foam pads in detergent or APC for extended periods (overnight, for example) as this will weaken the adhesive between the foam and backing material, leading to premature failure of the pad (most often seen with orbital machines).



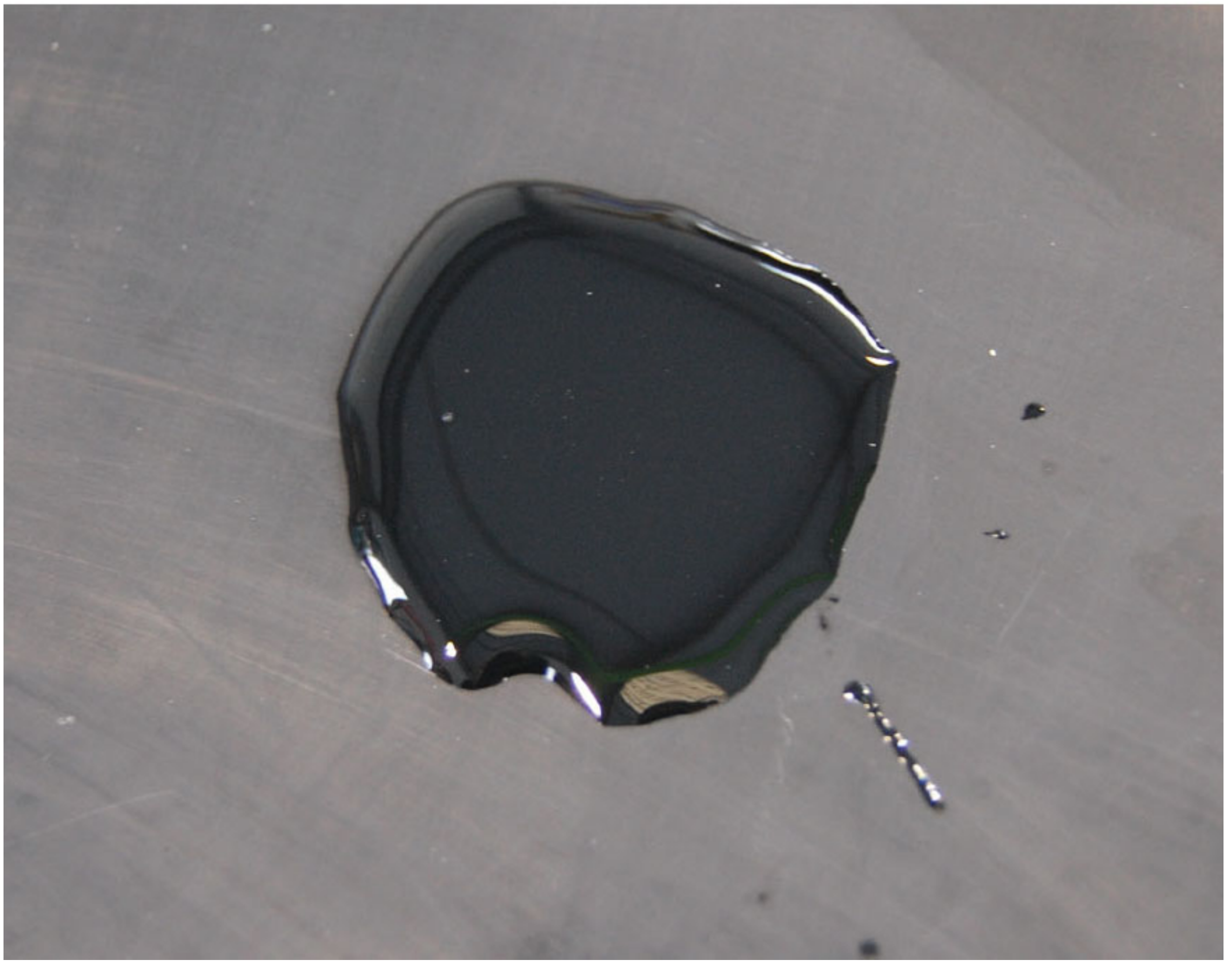
A spurring tool or blunt knife may be useful for removing a build-up of abrasive residue on the pad surface.

Wool pads: These can be cleaned with wool detergent or washing-up liquid under a running tap (in a similar way to foam pads), but they could be cleaned less often if the pad is lightly contaminated and the same polish is used from set to set (wool pads will really only be used for cutting, so it is rare for them to see such a wide range of polishes as, say, a medium-cut foam pad). If leaving the wool pad to ‘dust’, just make sure that it is spurred thoroughly and that most of the polish has been removed, or use an air nozzle to blast most of the dust away, if you have access to an air compressor. Light dust caught in the pile or fibres will integrate with the abrasives in the fresh compound when it is applied at the next polishing session, and there is little chance of undue marring if the polish is the same type or a similar cut. Never use hot or boiling water to clean wool pads, or tumble dry them afterwards as heat will damage the wool fibres. Machine-washing may also cause the strands of multi-ply wool pads to unravel, so clean them cautiously, by hand.

Pad washers speed up the pad-cleaning process and may prove indispensable to unit-based detailers.

Microfibre and short-pile rayon pads: Again, washing-up liquid and a running tap will clean these well. They don't tend to spur successfully.

FILLING PRODUCTS



Even water can fill: this is the effect of standing water on a sanded surface.

Adding a light glaze coat to paint is generally far easier than cutting paint back, and requires far less in the way of specialist products and equipment. Products to note are described below.

Glazes

A glaze is a finish-enhancing product that contains no abrasives. Instead, it is made up of oils that have the effect of darkening the paint finish and also masking light swirl marks. The glaze layer floods the surface, filling microscopic defects; this creates a level but temporary coating, improving the finish. Silicone oil is the most popular material employed in this role, and whilst it tends to evaporate after a couple of days, it is extremely effective at filling even the smallest fissures, pits and cracks in the paint.

Glazes can also be used to add a small amount of breathable protection to a fresh paint finish during the curing process, before a wax or sealant is applied. Some glazes may contain ingredients to specifically boost the filling ability of the product, such as silicone resin. Indeed, one of the most famous and versatile ‘filling’ products, Autoglym Super Resin Polish, was originally called Silicone Resin Polish, advertising the fact that it contains useful filling ingredients.

Polishes, Pre-Wax Cleansers and All-In-One Products

Abrasive polishes of all types frequently contain glaze oils and other filling ingredients, in order to mask secondary marring and to increase gloss. Filling may not be the product’s stated aim, but it could certainly be an (wanted or unwanted) attribute. This means that a simple hand polish may be an effective filling product, but you do need to be selective. Try the product on a small test area first – a 3000–4000-grit sanded test panel would be ideal – but it is revealing just to mask off a small section of the panel and then see how swirls appear afterwards. Remember always to complete a solvent wipe-down when checking how much a polish fills, otherwise you will never know how much improvement to the finish was caused by the abrasives, and how much was due to the glaze oils.

Waxes, Sealants and Resins

The ChipStik deposits a thick layer of wax into stone chips and other deep defects, resulting in a temporary fix of an approximate colour match.

Waxes, sealants and resins will typically contain glaze oils to enhance gloss, increase water repellence and provide lubrication (during application). They will also fill as general product types, because they are residual products coating the paint surface with a new finish. The amount of filling depends on coating thickness and the depth of the defect; it is rare for anything other than the lightest wash marring to be masked. The exception is the Turtle Wax ChipStik, a thick-layering, coloured wax specifically designed for the isolated filling of deep stone chips and scratches. This does not work so well on general marring, but it can be used successfully on aggressive damage or chips, despite the colour match being very approximate and the repair being temporary – for a better finish it is still recommended to use a full stone-chip repair process, where body-colour matched paint is applied (*see* below).

FILLING EQUIPMENT

Glazes can be applied by machine (say, during burnishing or jewelling), but this is far less common (or necessary) compared to applying polishes by hand. Glazes or other filling products simply sit on top of surface defects and do not need the mechanical action of grinding for them to work. Using a 'hand glaze' is quite common, and there would be nothing gained by machining if the paint is already perfectly refined. Of course, if the paint is 95 per cent refined, applying a glaze by machine may give you that final 5 per cent – but the polishing effect will be coming from the pad. You are really just continuing the polishing stage at this point by machine using a pad (and then leaving the glaze behind as a residue), rather than 'applying' a glaze by machine. Therefore, a selection of hand applicators (ideally soft, microfibre applicator pads) and soft, microfibre cloths would be suitable for any filling/glazing process.

MASKING PAINT DEFECTS BY FILLING GLAZE

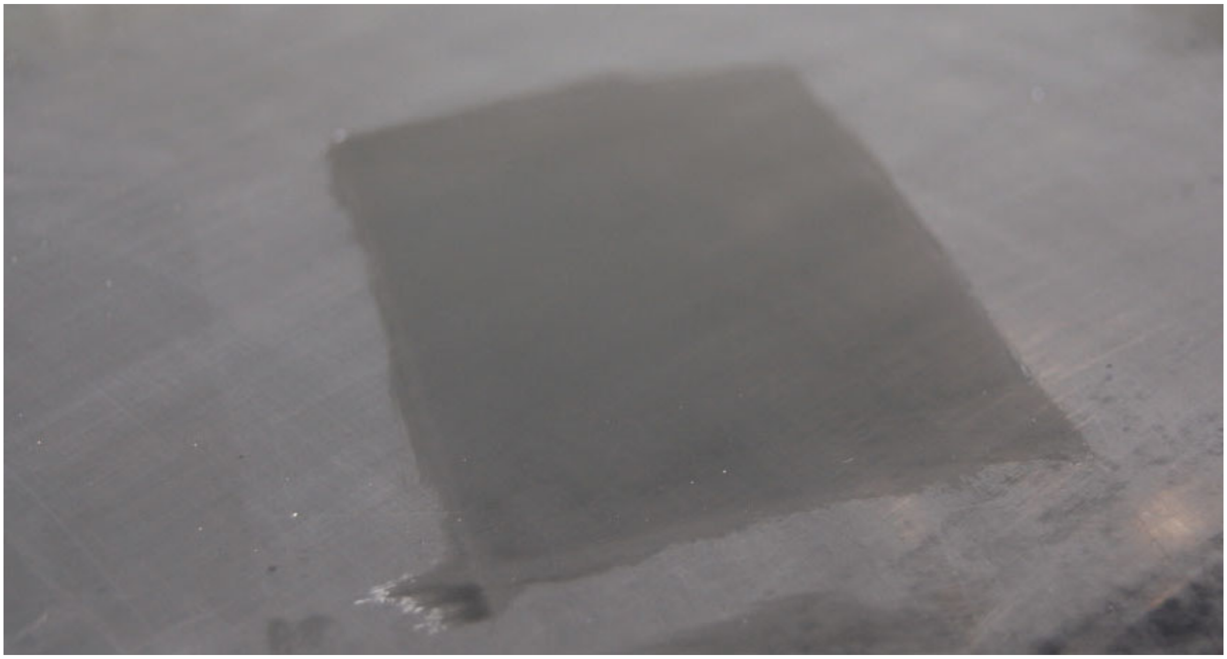
The filling/masking process using glazes is treated as a separate process for the purposes of this book, because many detailers will want to apply a dedicated glaze product by hand to hide defects and increase gloss, rather than machine polishing defects out of the paint surface permanently. However, the action of applying a glaze, or of filling or masking defects, is often a natural and automatic extension of another process, perhaps the application of a polish or wax. Everyone – from weekend car washers without any prior knowledge of detailing, through to seasoned professionals – will be potentially filling/masking a car's paint finish without even realizing it.

Filling is easy if you have the right product, which would be anything with filling characteristics, usually from silicone glaze oils. Without a good filling glaze or product with filling ability, the process below will be inconsequential.

You will need the following:

- A suitable glaze or product with filling/masking effects
- Masking tape (water-based adhesive type), if required
- A soft applicator pad or cloth (preferably a microfibre-covered foam applicator)
- A soft buffing cloth
- A lint-free microsuede buffing cloth

Eight-Step Method



A test patch will show you the filling/masking effects of your chosen product(s).

1. Ensure the paint has been well prepared in terms of pre-wash, wash and clay. A hand polish of the paint is also recommended because this will deep cleanse the paint, remove some of the more minor defects and even leave behind some initial filling residues.

2. It is recommended that the filling effect is tested by means of masking off a section of panel. There is little point glazing the whole car if additional gloss or filling/masking of defects fails to be achieved. Simply mask off a small section (say, 30 × 30cm) in a less conspicuous area to leave unglazed, and then glaze the rest of the panel.
3. Do not apply a glaze to a hot panel. Put a little product on to the microfibre applicator pad and spread it thinly on to the paint surface. The coverage should be complete and consistent. Glazes are normally quite visible during application, so check for bare spots or areas where the coating looks as if it is lightly and inconsistently applied.
4. Glazes do not generally need to cure and can therefore be buffed or levelled immediately, but check the instructions on the product label to be sure.
5. Buff the glaze ‘dry’ using a soft buffing cloth, turning it to prevent it becoming sodden with glaze oils.
6. Use a lint-free microsuede cloth for the final buffing stage. Glazes can ‘move about’ on the panel and microfibre pile may be inadequate to remove fine glaze oils completely. A pilefree microsuede is ideal for ensuring a perfect finish.
7. If you have undertaken a test section, check the finish of glazed and unglazed areas. If the result is favourable, complete the rest of the car and make good the test section by removing the masking tape and glazing the ‘dry’ area. Try not to overlap the areas in case the process creates darker, visible edges.
8. Glazes may ‘sink’ into very porous paint (old, UV-damaged, single-stage paint, for example). It is advisable to check the finish after twenty-four hours. If the glaze is patchy or inconsistent, repeat steps 3 to 6 again (assuming the surface hasn’t become contaminated in the meantime).

Should glazes need to be removed due to patchiness or smearing, a strong panelwipe (*see* above) may suffice.

WHY DO PRODUCTS APPEAR TO 'FILL' MORE THAN THEY USED TO?

The trend in recent years has been for paintenhancement products to 'fill' more than they abrade. This is most likely due to the following factors: firstly, the inherent danger of accidental permanent paint damage due to abrasion; secondly, the speed and ease of 'filling' a surface, compared to abrading it; and thirdly, the fact that most consumers will not notice whether an effect is permanent or temporary – the instant feeling of satisfaction will be similar, but the gradual degradation of the finish over the following days or weeks will invariably be far less noticeable.

Of course, it is often difficult to tell how a product actually works. The labelling or product type may give some indication (it would be assumed that most 'polishes' do actually contain polishing abrasives), but the car-care industry is rife with mislabelling and misleading product descriptions. Testing and using the product is far more illuminating: paste products with a gritty feel when rubbed between the fingers will often contain abrasives, whilst a clear, thin liquid may not. And finding out what has been permanently abraded, compared to what has been temporarily 'filled', is often possible using a strong solvent wipedown to remove any filling oils.

RECTIFYING THE FINISH THROUGH THE ADDITION OF PAINT

In some cases, defects cannot be polished out or sufficiently filled/masked. This could be because the damage is particularly deep, such as a key scratch or stone chip. Adding paint takes detailing to its absolute limits and into the realm of restoration. However, stone chips are so prevalent and can be so degrading to overall vehicle appearance – they particularly stand out when a car is clean and polished – it can make sense for a detailer to attend to them as part of the overall detailing process.

You should only attempt to tackle stone chips or a deep scratch if, firstly, a respray of some kind has been ruled out (respraying a whole panel or more will generally give a better finish than tackling defects in isolation); and secondly, the stone chips or scratch are limited or contained – a dozen stone chips would be feasible to rectify, but tackling any more is unlikely to be cost- or time-effective; likewise, fixing a small but deep key scratch is logical, but trying to remove extremely long and deep multiple key scratches across multiple panels may not be.

Finally, remember that adding paint to the surface is a relatively permanent fix and also takes quite a lot of additional time to do because the paint needs to cure and harden. If you are not sure of the results, or lack the time to complete this stage, it is best to miss it out completely.

RECTIFYING MINOR PAINT DEFECTS: STONE-CHIP AND DEEP SCRATCH REPAIR

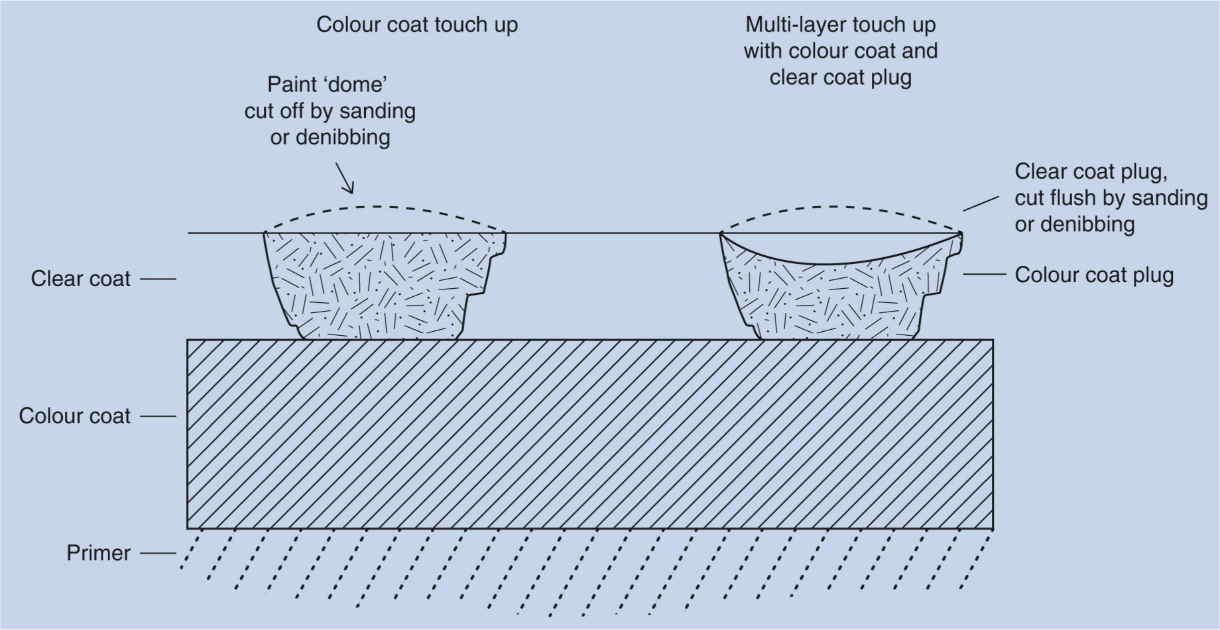
This process is undertaken when the paint is clean and decontaminated, but before it is polished. Polishing stone chips or deep scratches will be counterproductive if you intend to fill them with paint, because firstly, the fresh paint can’t adhere to rounded or sloping edges as easily as it can adhere to a sharp edge; and secondly, the polish stage may leave behind glaze oils and polishing dust that once again will prevent the paint from adhering. You will, however, need to polish the fresh paint after it has hardened to ‘smooth it in’ and integrate the new paint into the existing finish.

You will need the following:

- The correct shade of paint for your car (touch-up pen, stone-chip repair kit)
- Panelwipe or strong solvent
- Wooden toothpick(s) or glass-fibre nib
- A suitable grade sandpaper for wet sanding, or professional paint de-nibbing tool

Eight-Step Method

De-nibbing tools level raised paint inserts without sanding or polishing the surrounding area.


Colour coat touch up
Multi-layer touch up with colour coat and clear coat plug
Paint 'dome' cut off by sanding or denibbing
Clear coat plug, cut flush by sanding or denibbing
Clear coat
Colour coat plug
Colour coat
Primer

Paint layers within rectified stone chip.

1. Wash and decontaminate the paint surface, but don't clay the chipped area.
2. Use a panelwipe or strong solvent to clean the stone chip/scratch and the area immediately around it.
3. Use the wooden toothpick or glass-fibre nib tool to ensure the chip or scratch is totally clean and free from polish dust or paint flakes; flaking paint should be nibbled back to a good edge.
4. Clean the area again using panelwipe or solvent and allow to dry.
5. Apply the paint using a fine brush or wooden toothpick. Whilst some kits contain a primer coat, base coat and a clearcoat, the chances are that firstly, the stone chip doesn't go below the base coat anyway; and secondly, the clearcoat will be redundant because you will flat the base (colour) coat to the height of the existing paint (*see* diagram).
6. Build up shallow layers of paint, about an hour apart. Ensure the final paint insert sits slightly proud of the surface.
7. Allow twenty-four hours for the painted insert to harden. Now use the de-nibbing tool (a tungsten carbide blade) to cut the insert to the same height as the surrounding paint surface. Alternatively, use P2000–P4000-grit sandpaper to 'wet sand'

the insert flat to the surrounding paint. The paint will then need polishing to attain a final finish. Note that a de-nibbing tool is preferable because wet sanding the surrounding area will remove other defects and blemishes in the paint, such as orange peel, creating a ‘smooth’ spot that could potentially stand out. A de-nibbing tool only levels the paint chip, so its use is less obvious and intrusive. On a cellulose-painted car, a harsh solvent may be used to blend the new paint insert into the surrounding paint, by partially dissolving it – but note that this is a delicate and potentially dangerous technique, and could lead to permanent paint damage, or accidental removal of the fresh paint insert.

8. Check that the paint chip is a reasonable colour match and that the paint hasn’t sunk. You may be able to build up more paint in the chip if it has sunk. If it is a poor colour match, consider removing it completely (and carefully) and then repeating Steps 2 to 8. Be careful using solvents or solvent-based products (including waxes or sealants) within a few days of application, as these could remove fresh paint chips.

PAINT SURFACE GLOSS ENHANCEMENT/GLAZING

A polished surface is going to look superb – probably within a few per cent of its ultimate finish if machine polished – but even a highly polished paint surface can be enhanced, or rather ‘gloss enhanced’ through the use of a glaze. Whilst glazes will be used for filling or masking mildly defective paint surfaces, they can also add gloss to a wide range of paint finishes. It should be noted, however, that the more highly polished a surface is, the less there is to gain from an additional glazing/gloss enhancement stage.

We have covered the use of a hand glaze earlier in the book, and it is quite a simple technique. Just be aware that whilst adding an oily glaze to a finish may improve the appearance, it may reduce the performance of subsequent protection products applied to the surface, or even cause application issues. Glazes tend to be ‘wetter’ products than usual, and can be smeary or greasy. If protection is more important to you than extracting the final per cent of gloss from the paint, then simplify your regime and omit an additional glaze stage. Sometimes less can be more.

GLAZING PRODUCTS

Glazing oils are found in polishes, waxes and sealants, and not just dedicated glazes. So if you are waxing after having polished, there may be no need to carry out an additional and separate glazing stage. You will have enough glaze oils applied to the panel by the polish, and then later, by the wax. Instead of listing all types of product that contain glaze oils, we will concentrate on dedicated glazes.

Hand Glaze

A glaze, or glazing agent, enhances the appearance of a surface by covering it in a thin film of oil, wax or other residue. By flooding the surface with a fine coating, reflection and refraction can be maximized, improving the finish. Glazes are not abrasive and therefore do the bulk of their work simply on application to the panel; nor do they need to be worked heavily. Therefore a liquid hand glaze is a good choice.

Do not be misled by waxes calling themselves ‘glazes’. Whilst a glaze may contain wax, and a wax may contain glaze oils, the primary function of the product should be scrutinized. A wax with a good glazing effect or containing a lot of glaze oils will still primarily be a protection product (LSP/PP in acronym terms) rather than a mere gloss enhancer, and should therefore be treated like one. The naming of products is as much about how they are marketed as it is about their role or ingredients, and ‘glaze’ may seem more exotic to consumers than plain old ‘wax’.

Machine Glaze

A machine glaze is simply a glaze that can be applied by machine polisher. It is likely to be highly lubricious to allow a long working time.

GLAZING EQUIPMENT

Ultra-fine finishing pads: When ‘burnishing’ or ‘jewelling’ paint (in other words, glazing by machine) there will be no cut from the glaze but there will still be a small amount of ‘cut’ from the pad. Because the polishing stage will normally have been completed by now, there is little to be gained from having any cut at all acting on the paint. So an ultra-fine finishing pad, or certainly the softest finishing pad you can find in your collection, is invaluable.

Ultra-soft applicators and buffing cloths: The paint may be completely blemish free at the time a glaze is applied, so it is imperative that all applicator pads and buffing microfibres are as clean and soft as possible. Glazes are frequently greasy and sticky, so a lint-free microsuede buffing cloth can prove useful for the final buff.

GLOSS ENHANCEMENT/GLAZING OF THE PAINT SURFACE BY HAND

Glazes gain relatively little from machine application, so hand application will be more convenient – and almost as effective – in most circumstances. Remember that there may be little point undertaking this process if the paint has already been machine polished, and that glazes can also diminish the longevity of waxes or sealants applied over them. Undertake gloss enhancement if the finish is an absolute priority: say, if exhibiting a car at a show.

You will need the following:

- A suitable glaze or product with glazing effects
- An ultra-soft applicator pad or cloth (preferably a microfibre-covered foam applicator)
- An ultra-soft buffing cloth
- A lint-free microsuede buffing cloth

Six-Step Method

Microsuede cloths are ideal for buffing glazes and oily residues, being absorbent and free from pile.

1. Ensure that the paint has been well prepared in terms of pre-wash, wash and clay. A hand polish of the paint may also be beneficial because this will deep cleanse the paint, remove some of the more minor defects and also leave behind some initial glaze oils. There may be little point adding a hand glaze over machine-polished paint due to the high gloss that will already have been achieved.
2. Do not apply a glaze to a hot panel. Put a little product on to the microfibre applicator pad, and spread it thinly on to the paint surface. The coverage should be complete and consistent. Glazes are normally quite visible during application, so check for bare spots or areas where the coating looks as if it is lightly and inconsistently applied.
3. Glazes do not generally need to cure (and can therefore be buffed/levelled immediately), but check the instructions on the product label to be sure.
4. Buff the glaze dry using a soft buffing cloth, turning it to prevent it becoming sodden with glaze oils.
5. Use a lint-free microsuede cloth for the final buffing stage. Glazes can ‘move about’ or smear on the panel, and microfibre

pile may be inadequate to buff fine glaze oils completely. A pile-free microsuede cloth is ideal for ensuring a perfect finish.

6. Glazes may ‘sink’ into very porous paint (old, UV-damaged, single-stage cellulose paint, for example). It is advisable to check the finish after twenty-four hours. If the glaze is patchy or inconsistent, repeat Steps 2 to 5 again (assuming the surface hasn’t been contaminated in the meantime).

Should glazes need to be removed due to patchiness or smearing, a strong panelwipe may suffice. Note that this could result in a particularly ‘flat’ finish, and you would be advised to apply some form of coating afterwards, if the paint can take it. This could be another layer of (fine) polish, a lighter/less oily glaze, or a wax or sealant.

GLAZING THE PAINT SURFACE BY MACHINE (BURNISHING/JEWELLING)

After paint defects have been corrected by machine, this would typically be the end of the machine-polishing process. Gloss will already be extremely high due to oils from the polishing compounds, and the paint will be reflective due to the removal of surface defects.

However, some detailers look to take things further with a ‘burnishing’ or ‘jewelling’ stage. This is where the paint is machined in a process that elicits almost no cut at all, with low speeds, low temperatures, low pressure, and a glaze (or even water!) as the medium of choice – the only cut present will be from the pad, and this tends to be made from the gentlest of finishing foams. For those chasing the highest levels of finish, this process is inevitable – but for most detailers the rewards will never justify the time invested. Certainly, professional detailers may find it difficult to find clients who are willing to pay a full hourly rate for such extravagance.

You will need the following:

- A machine polisher
- A soft backing plate
- An ultra-soft finishing pad
- A glaze or extremely fine polish

- An ultra-soft buffing cloth, ideally made from microsuede

Six-Step Method

1. Machine polish the paint with fine-cut compounds prior to burnishing/jewelling.
2. Apply three or four pea-sized beads of glaze to an ultra-soft finishing pad, mounted on a soft backing plate, and then spread the glaze on to the panel (the working area should be 40–60cm square). Whilst water can be used, there are risks of paint burn associated with this technique if the pad is too abrasive or gets too hot, so it is not recommended; a glaze will also allow a longer working time.
3. Start the machine at spreading speeds, and ensure the glaze covers the working area (600–1,000rpm).
4. Step up the machine speed to 800–1,200rpm, and do ten to fifteen passes in a set, with light pressure only. Glazes should be much oilier and therefore more ‘workable’, with less chance of drying out or dusting.
5. Buff with an extremely soft microfibre – a standard microfibre could mar the surface and undo all the hard work undertaken beforehand. A microsuede cloth will be absorbent and will prevent any ‘drag marks’ in the oils (typically caused by microfibres with a medium to long pile).
6. Repeat Steps 3 to 5 for at least another four or five sets. Burnishing is all about undertaking extensive and repetitive sets, with each one cutting the paint an almost negligible amount.

PAINT SURFACE PROTECTION

To many, the waxing (or ‘sealing’) protection stage is the most accessible and enjoyable aspect of detailing. There is little glamour or glory in merely cleaning a car – it is a necessary evil for many motorists, and even automated car washes can do it. And whilst there may be some satisfaction in decontaminating a car using a clay bar, and paint rectification is undoubtedly hugely rewarding, it is the later ‘waxing’ stages of a car-care regime that most detailers relish the most – perhaps because it is relatively simple, often has a visible impact, and above all, heralds the end of the detailing process.

Protecting the finish also has practical benefits: it minimizes long-term paint damage, and ensures that the time, money and energy spent on the detailing process will not be wasted. Upper areas are most in need of protection, especially in the summer months due to UV attack from the sun’s rays, but the lower sides of a vehicle may need more protection during the winter months because of kerbside splashback (which is also likely to have a high salt content).

It is rare to forgo paint protection entirely, out of choice. The three most obvious scenarios would be firstly, within a short time after a panel has been resprayed (some bodyshops like paint to remain unsealed for thirty to ninety days after painting, to enable the paint to ‘outgas’ fully); secondly, when a car is about to go into a bodyshop, and the addition of paint protection is likely to cause ‘fisheyes’ or be otherwise difficult to remove; and thirdly, on a fully machine-polished car about to enter a concours competition, when the addition of a wax is unlikely to add anything to the finish (and could even take something away).

This section deals with the protection of exterior paint surfaces. By ‘paint’, we mean any permanently applied coating found on the exterior bodywork of a car, which takes the form of paint or clearcoat (‘lacquer’). There are other surfaces to be enhanced and protected (trim and unpainted plastic areas, for example), but these will be covered in a later chapter to avoid confusion. Paint, despite its many varieties, can generally be approached in the same way, and there are uniform products and processes to enhance and protect it.

PROTECTION PRODUCTS

Protection products should routinely be applied to preserve the finish achieved; applying waxes or sealants can also be one of the more enjoyable and rewarding parts of the detailing process.

Protection products (or 'last step protection' products) are, in general terms, non-abrasive protectants commonly containing a blend of natural and/or synthetic ingredients. Whilst protecting the paint from the elements and contaminants, they may also enhance the finish through a filling effect (*see* above), and therefore increase gloss. Whilst some protection products may contain abrasives to give them greater 'all round' performance, paint correction is not their primary aim and therefore they should not be classed as polishes. This kind of crossover – polishes with a little wax in for a small amount of residual protection, and conversely waxes with a little polish in for a small amount of paint cleansing or swirl removal – creates tremendous confusion, to the point where pure polishes are often mistaken for protection products (when they offer little or no protection at all), and pure protection products are referred to as ‘polishes’ despite their incapacity to abrade paint.

The simple rule is to analyse the product, whether in terms of reading the label, testing it and seeing the results, or by scrutinizing reports posted by others, and then seeing what is actually being achieved.

PROTECTION PRODUCT TYPES

Carnauba wax is a natural ingredient found in many paste waxes. It is the hardest natural wax available, but modern synthetic waxes may offer more performance.

Protection products can be roughly divided into two common classes: waxes and sealants. In technical terms, ‘wax versus sealant’ comparisons are meaningless. A wax will effectively seal a paint surface, and claiming that one is natural and one is synthetic is simply incorrect because you can get a myriad of synthetic waxes. However, in detailing terms the word ‘wax’ has come to mean a substantially natural paste product made from ingredients such as beeswax and carnauba wax, whereas ‘sealant’ has come to mean a synthetic protectant, probably based on polymer or crystalline technology and delivered in liquid form by bottle or spray.

Of course, you can get carnauba emulsions, which are natural waxes in a liquid state. And most ‘waxes’ will contain ‘sealant’ ingredients as fortifiers (just as paste ‘sealants’ may use natural carnauba wax in their recipes).

For the sake of simplicity we shall put semantics to one side and propose the following definitions:

Wax: A paste product substantially composed of natural ingredients.

Sealant: A liquid product substantially composed of synthetic ingredients.

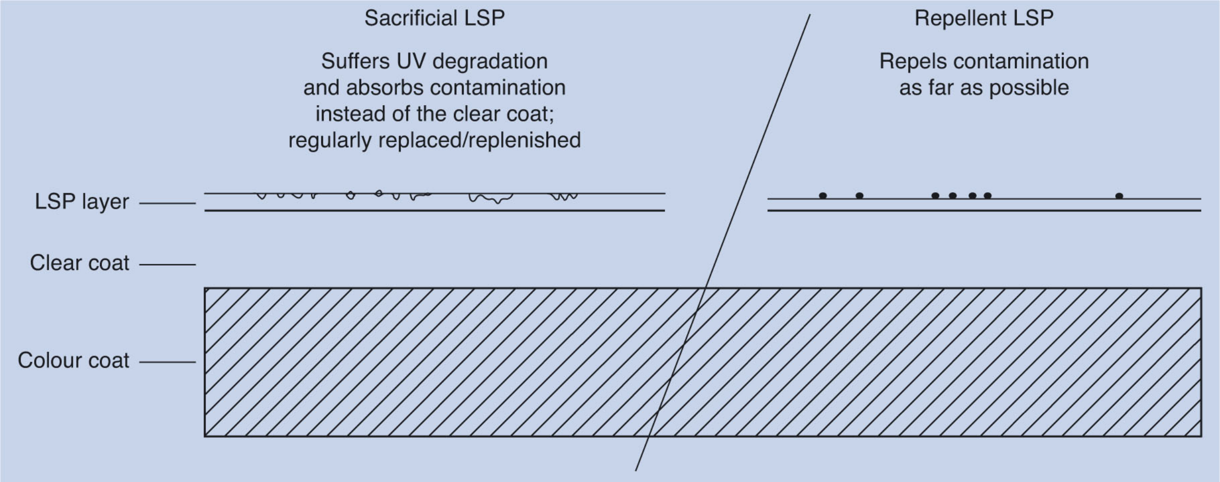
Hybrid: A paste or liquid product that contains a significant amount of both natural and synthetic ingredients.

So which is best? Or what are the real-world differences? Well, just as waxes and sealants are almost impossible to define accurately, they are also extremely difficult to compare or describe accurately in performance terms. Conventional wisdom would say that sealants have better longevity or durability, yet a good ‘wax’ may outlast a poor ‘sealant’. Or it may be said that sealants are trickier to apply than waxes, yet a simple sealant may be far easier to use than a natural wax that is overladen with carnauba. The simple answer is that you should always look at the characteristics of a specific product, and not be led by its supposed product ‘type’.

If generalizations were required, popular opinion would be as follows:

- Waxes have a warm look and are easy to apply, but have poor longevity and durability, and they protect paint by acting as a sacrificial barrier to contamination
- Sealants, on the other hand, have a crisp, cold look and good longevity and durability, but tend to be trickier to apply; they also tend to repel contamination rather than absorb it
- Hybrids, one would assume, have a mix of these characteristics, hopefully offering the best of both worlds, rather than the worst

attributes of each product type


Sacrificial LSP
Suffers UV degradation and absorbs contamination instead of the clear coat; regularly replaced/replenished
Repellent LSP
Repels contamination as far as possible
LSP layer
Clear coat
Colour coat

Sacrificial versus repellent paint protection.

These generalizations do, however, make some kind of sense. If a sealant adheres to the paint better, it could have a narrower application window, and punish a user who leaves it on too long before buffing, or applies it to a hot, dark-coloured bonnet on a sunny afternoon. The more regimented molecular structure of a synthetic polymer gives a crisp reflection, but may seem more sterile in comparison to the rougher microscopic surface of a natural wax, which may diffuse or reflect light in a more subtle way.

This also raises the question of whether it is better to have a paint surface protected with a sacrificial layer that absorbs contamination but is more regularly removed and replaced, or a repellent layer that attempts to resist contamination completely.

Scientifically it is difficult to draw a conclusion due to a lack of investigation and evidence in this area. Is it better to replace a contaminated sacrificial coating regularly, perhaps with a product that has an easy application, few side effects and a great finish? Or to fend off all contaminants as effectively as possible, whatever the downsides, knowing that any temporary coating will degrade eventually anyway?

What is certainly true is that many contaminants are physically harder in nature than the ‘repellent’ layers they land on, so they could still embed in them. If this is the case, only the toughest crystalline/ceramic or ‘quartz’ nano-sealants would offer a real advantage – yet their small particle size means that they may faithfully follow the microscopic pits and fissures of paint (especially if it has not been machine polished) – and contamination could still become attached to the relatively uneven, but ultrahard coating. In effect, softer ‘traditional’ sealants may offer superior repellence, because they have a smoother and more uniform coating that prevents dirt from easily adhering to them (although there will be a wider variety of contaminants that could penetrate the coating over time).

Ultimately, waxes and sealants both have their fans and their uses. Even the latest nano-ceramic sealants have weaknesses and disadvantages – they are susceptible to water spotting, caustic erosion and the aforementioned surface contamination, for example. Perhaps plastic paint protection film (PPF) or another coat of clearcoat (potentially hundreds of times thicker than a wax layer and with a longevity of twenty years or more) is the cheapest and simplest answer for those who demand more protection than temporary coatings can provide.

ASSESSING PROTECTION PRODUCTS

The dynamic performance of a wax or sealant – we shall ignore finish and ease of application for now, although it is acknowledged that these may be highly important – can be assessed in three ways: *protection imparted*, in terms of scratch resistance, repellence of contamination or sacrificial absorption of contamination; *durability*, meaning resistance to premature removal, perhaps due to the action of strong detergents or solvents used on the paintwork subsequently; and *longevity* – the natural lifespan of the product, before being degraded by natural elements. In the following sub-sections we will look at these in more detail.

PROTECTION IMPARTED

Water beading is frequently used to assess the performance of protection products, because these products often cause beads where none were there before. This can be misleading, however, and beading should always be interpreted carefully.

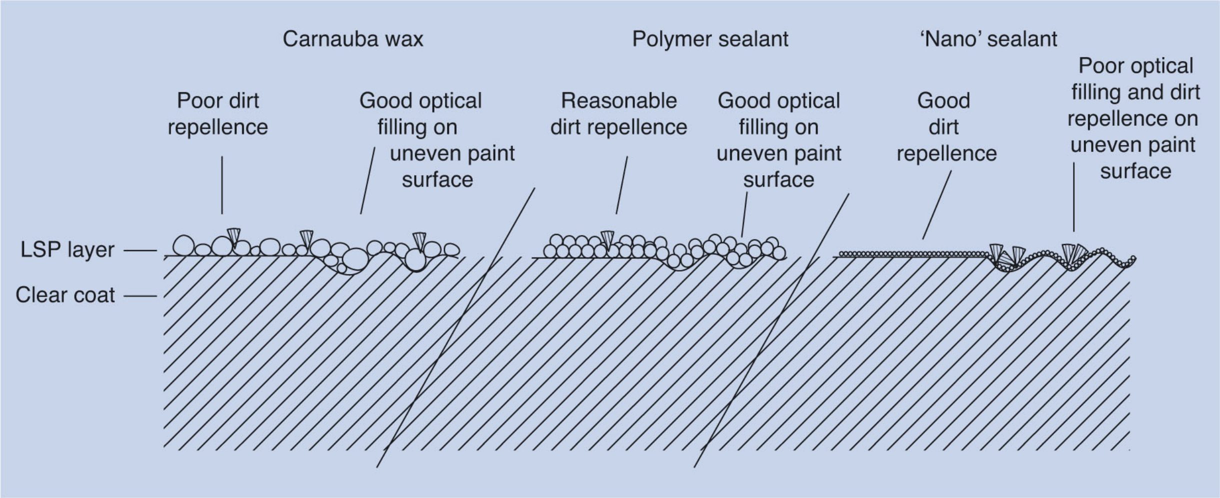
Any coating sitting on top of a painted surface is going to impart some kind of protection simply by acting as a cushion or barrier between the paint and the elements or contaminants that may act upon it. However, the nature of the protection (and the effectiveness of it) will depend upon the coating. An ultra-hard, nano-ceramic ‘quartz’ sealant, for example, may make the paint more scratch resistant for months or even years, yet a simple glaze of silicone oil may merely increase water repellence for a couple of days, and impart little scratch protection at all.

Coatings protect in two general ways: by repellence or absorption, and usually a combination of them both. This means that they will either repel the elements/contaminants, helping to prevent them coming into direct contact with the paint, and thus keeping the car clean and the finish as immaculate as possible; or they will act as a ‘sacrificial layer’ and absorb the contamination, before it has a chance to act directly on the paint finish. This is why some coatings ‘yellow’ over time – they absorb dirt and gradually turn a yellowish-brown colour. When the coating is cleaned or removed, the yellow tinge will fully or partly disappear.

Most coatings will be both repellent and absorptive to a certain degree, with synthetic ‘sealants’ being more repellent as a type, and natural waxes being more absorptive. The lesser durability and longevity of natural waxes actually helps in this case, because when acting as a sacrificial layer, they can be removed more easily having become contaminated. Note that nano-ceramic ‘quartz’ sealants can be very durable and capable of resisting harsh contaminants, but they may still suffer from surface contamination due to the fact that the coating faithfully follows the pits and contours of the original paintwork beneath, and they may also be susceptible to static electricity when buffed with a microfibre cloth, thus attracting dirt and dust particles of an opposite charge. This means that they will protect paint well and wash or rinse clean readily, yet may appear just as dirty, just as quickly, as ‘lesser’ protectants.

Finally, what the coating will absorb or repel depends on the coating structure. A dense synthetic coating of small particle size may give a slick surface that repels contamination better and could even be harder than the paint itself (and therefore offer some kind of scratch resistance). But a softer coating made of less regularly spaced particles may resist contamination less, absorb more dirt into its irregular surface, and also fail to prevent scratching by being less dense.

DURABILITY


Carnauba wax
Polymer sealant
'Nano' sealant
Poor dirt repellence
Good optical filling on uneven paint surface
Reasonable dirt repellence
Good optical filling on uneven paint surface
Good dirt repellence
Poor optical filling and dirt repellence on uneven paint surface
LSP layer
Clear coat

Density and layering of protectants.

Durability is how well a coating can resist weathering or attack from contaminants, detergents, solvents or caustic cleaning products. It is less of an issue if a car is garaged and infrequently driven, or if it is sympathetically maintained (for example, washed with a pH-neutral shampoo rather than a strong traffic film remover). The durability of a coating is normally dictated by its chemical make-up. Organic coatings, such as natural waxes, have irregular molecular bonds that are more easily broken than the regimented molecular structure of some synthetic materials, and most coatings will be extremely thin, whatever their nature (far less than a micron, in almost all cases). However, even durable nano-ceramic sealants can be vulnerable, as these may be susceptible to alkali attack, possibly resulting in water-mark etching due to the limescale content of tap water, for example.

LONGEVITY

The length of time a coating lasts on the paint is referred to as its 'longevity'. This really depends on how well the coating has adhered to the paint, and then the rate of degradation thereafter due to external factors (environment, storage, maintenance). Coatings with smaller particle sizes may be able to adhere to the paint surface better, because, under a microscope, a paint surface would appear quite 'rough' with plenty of 'anchor points'. These anchor points can trap dirt and inhibit reflectivity (which is undesirable), but they are beneficial in giving temporary wax/sealant coatings something to latch on to. This is often why coatings with larger particle sizes (such as natural waxes) have lower longevity: they can't lock into the coating as successfully as 'nanoceramic' coatings with smaller particle sizes.

When assessing the performance of a wax or sealant with reference to protection, durability and longevity, it is essential to get the car as clean as possible. Little can be learned by looking at the water behaviour of a dirty car, for example. Dirt sitting on top of a protected surface will cause water to behave in the same way as if it were sitting on a dirty but unprotected surface. In some cases, assessing a protection product may prove impractical, or could even be considered irrelevant: application intervals are really what matter to most detailers. The recommendation would be to reapply a protection product (or 'top up' an existing protection product using a spray sealant or other coating) when half its anticipated lifespan has elapsed.

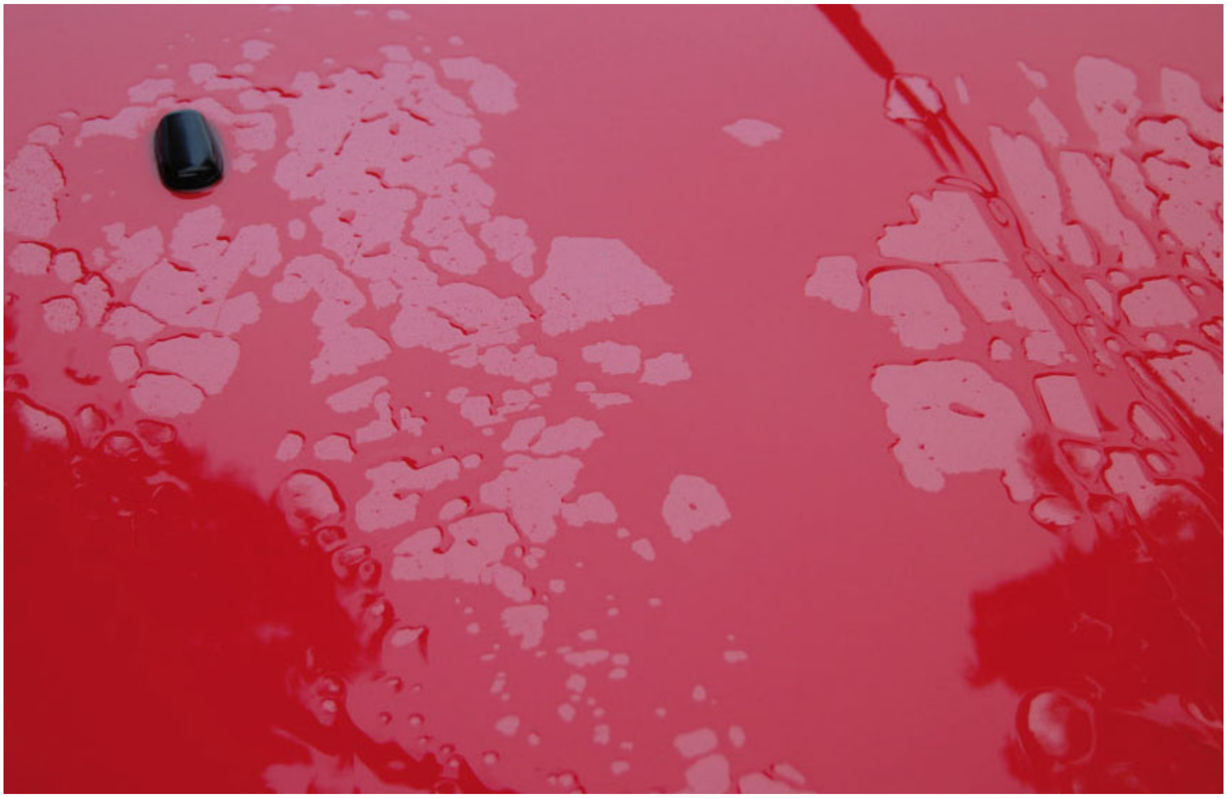
Note that continually topping up waxes with additional layers of wax or spray sealant is never a good idea, because dirt could be trapped between the coats. One or two 'top-up' layers would be unlikely to cause an issue, especially if the top-up product contained a solvent (and could therefore clean the existing coating to a certain degree), but removal, decontamination and reapplication of a principal protection product should certainly be considered after three or four 'top-ups'.

ASSESSING A WAX OR SEALANT (GENERAL)

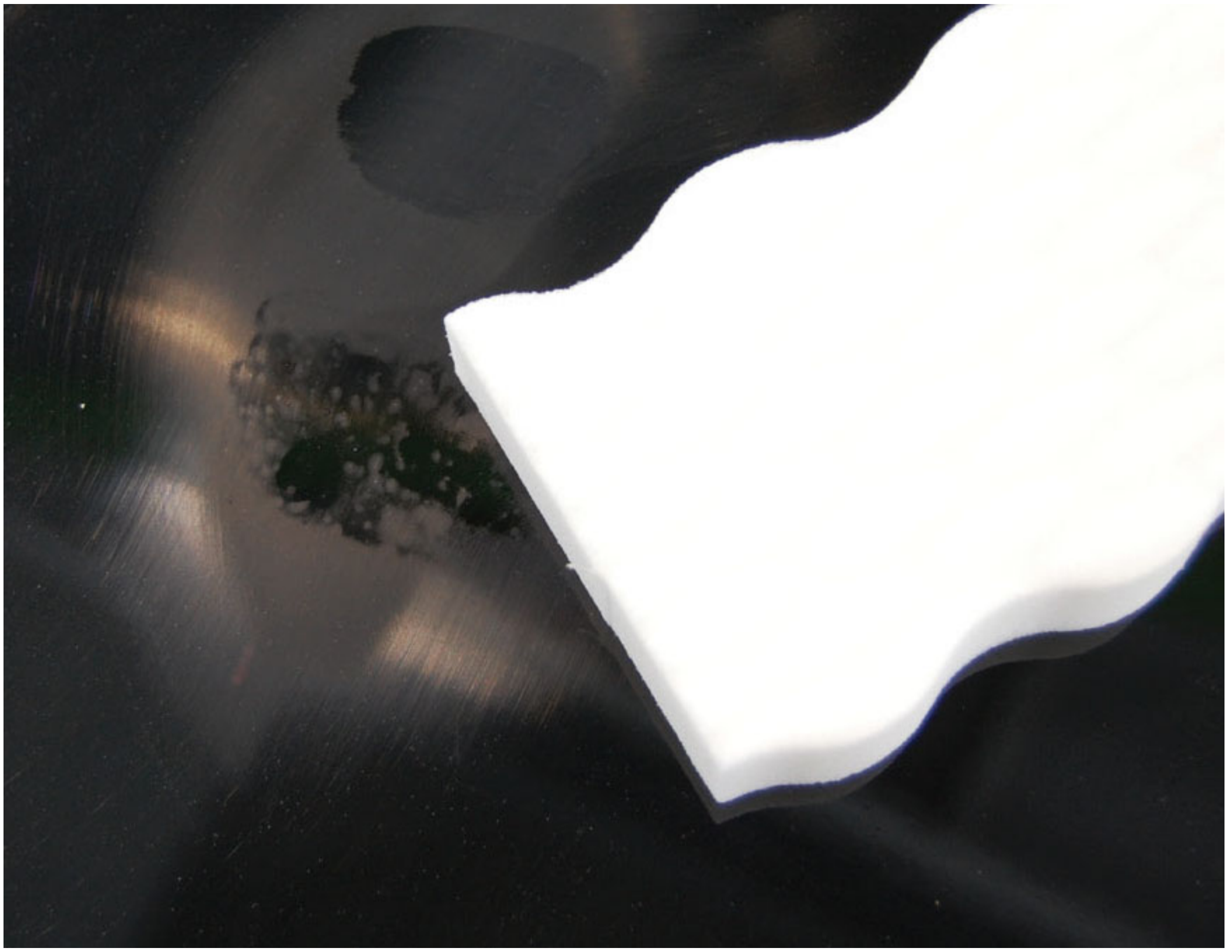
You will need the following:

- Pre-wash, wash and rinse equipment, plus products (pH-neutral or mild in strength)
- A water sprayer
- A water bottle
- A plastic 'sandwich' or freezer bag

Nine-Step Method



Good sheeting will mean rapid water clearance from the panel, perhaps leaving the surface predominantly dry.



A scratch test can reveal the abrasion resistance of a protection product. In this instance, a nano-ceramic coating is tested versus an uncoated section using a micro-abrasive 'magic' sponge.

1. Firstly, pre-wash a section of the car with water or a mild pre-wash product. It may be worth cleaning a deliberately 'uncoated/unwaxed' area of the car as well, such as the door sill, as a control area.
2. Wash the paint surface (and control area, if relevant) with a pH-neutral and *residue-free* shampoo solution (if the shampoo contains a gloss-enhancing silicone or protective sealant residue, this will give a false result) using the twin-bucket method (*see* earlier in the book for a closer look at the twin-bucket wash technique).
3. Now rinse the area(s) thoroughly with plain water (residual detergents will kill water beading, so these must be removed) and dry the paint surface with a soft microfibre cloth. Whilst

further decontamination of the paint surfaces (using clay, for example) would be possible, this could degrade the coating and lead to a premature ‘failure’ result.

4. Place a hand inside a clear plastic sandwich/freezer bag and lightly touch the paint surfaces – this will indicate how slick they are. A sealant will usually be slicker to the touch than a wax, and differences in comparison to the control area could possibly indicate how much product remains. Note that claying and polishing surfaces could make them slicker, so be wary of drawing false conclusions.
5. Now get a water spray and apply a light mist of water to the assessment area, and the control area if relevant. A water-repellent surface, indicated by small upright beads of water, may indicate the presence of a wax or sealant. You’ll need to compare this to the ‘naked’ control area to see what difference there is. If you don’t have a control area, you will be relying on your knowledge and previous experience of the product. Remember that even unprotected paint can bead well if it has glaze oils on it, or if it is otherwise clean and smooth – plus some sealants are hydrophilic (water-loving) rather than hydrophobic (water-hating) and may show flat beads – these products will only excel in the subsequent sheeting test. It takes an expert eye to assess whether the beading is due to the sealant or wax rather than other factors, and if it has degraded (and if so, by how much).
6. Next, pour water over the panel and note how well it runs off. If it tries to clear itself from the panel, leaving a predominantly dry paint surface behind, the surface has good ‘sheeting’ characteristics. Unprotected paint will typically ‘pool’ water and stay wet. In theory, if a dense sealant has coated the ‘rougher’ paint with a smoother, slicker layer of water-repellent material, the water will have too little surface tension to hold on to the coating. Again, check the assessed area versus the test area, but good sheeting or ‘fish eyes’ (areas of dry paint) appearing and then expanding rapidly in the standing water are good indications of some form of subsequently applied coating.

7. You should be able to assess the nature and presence of a surface coating using the technique above, and by regularly re-testing the panel(s) you should be able to gauge longevity. Durability and protection can also be tested.
8. To test durability, the coating will inevitably be treated aggressively and could be removed, so it is best not to do this on a ‘live’ detail. A simple and effective technique is to wipe the coated panel with aggressive substances, or to treat it to intense contamination removal methods. For example, a strong washing-up detergent solution could be wiped over the panel repeatedly, and the results noted. Then a mild solvent, all purpose cleaner or traffic film remover, could be used; even a clay bar could be pressed into action. If the coating resists these, it will be durable (and likely to have good longevity, too) and only the action of a very strong solvent, acid or alkali may remove it. Some ‘nano-ceramic’ sealants could require polishing off with strong abrasives. Of course, these types of test are only really illuminating if carried out on a number of different coatings simultaneously, for the purposes of benchmarking (or if other kinds of comparative assessment are undertaken).
9. Scratch resistance – or coating hardness – cannot be measured easily, and getting a scientific ‘mohs’ measurement is going to be near impossible for the detailer. However, a rough indication of scratch resistance can be calculated by rubbing mildly abrasive materials on to sections of coated and uncoated test panel. A ‘magic’ sponge of the type sometimes used to deep-clean household surfaces is perfect, being only mildly abrasive, but never use this on a ‘live’ panel. If you don’t have a ‘magic’ sponge, use a waffle-weave microfibre or some terry-cotton cloth. When a light is shone on to the coated section, a 50/50 reveal against the uncoated area should show whether the coating is resisting any abrasion or not.

LSP	*Carnauba Wax*	*Hybrid Wax*	*Synthetic Sealant*	*Nano-ceramic Sealant*

Initial beading	Excellent	Excellent	Average to excellent	Average to excellent
Long-term beading	Poor due to dirt ingress and breakdown	Average	Average to good	Average to excellent
Sheeting (water clearance)	Average	Average to good	Good to excellent	Average to excellent
Longevity and UV resistance	Poor to average	Average to good	Average to good	Excellent
Durability and scratch resistance	Poor	Average to good	Average to good	Excellent
Heat resistance	Poor	Good	Good to excellent	Excellent
Ability to fill defects	Excellent	Excellent	Good to excellent	Poor to average
Finish	Excellent (initially): warm and deep	Excellent: crisp and reflective	Excellent: crisp and reflective	Excellent on machine-polished surfaces, otherwise average to good
Ease of application	Excellent	Good	Average to good	Poor to average
Cost	Low	Low to mid-price	Low to mid-price	Mid-price to high

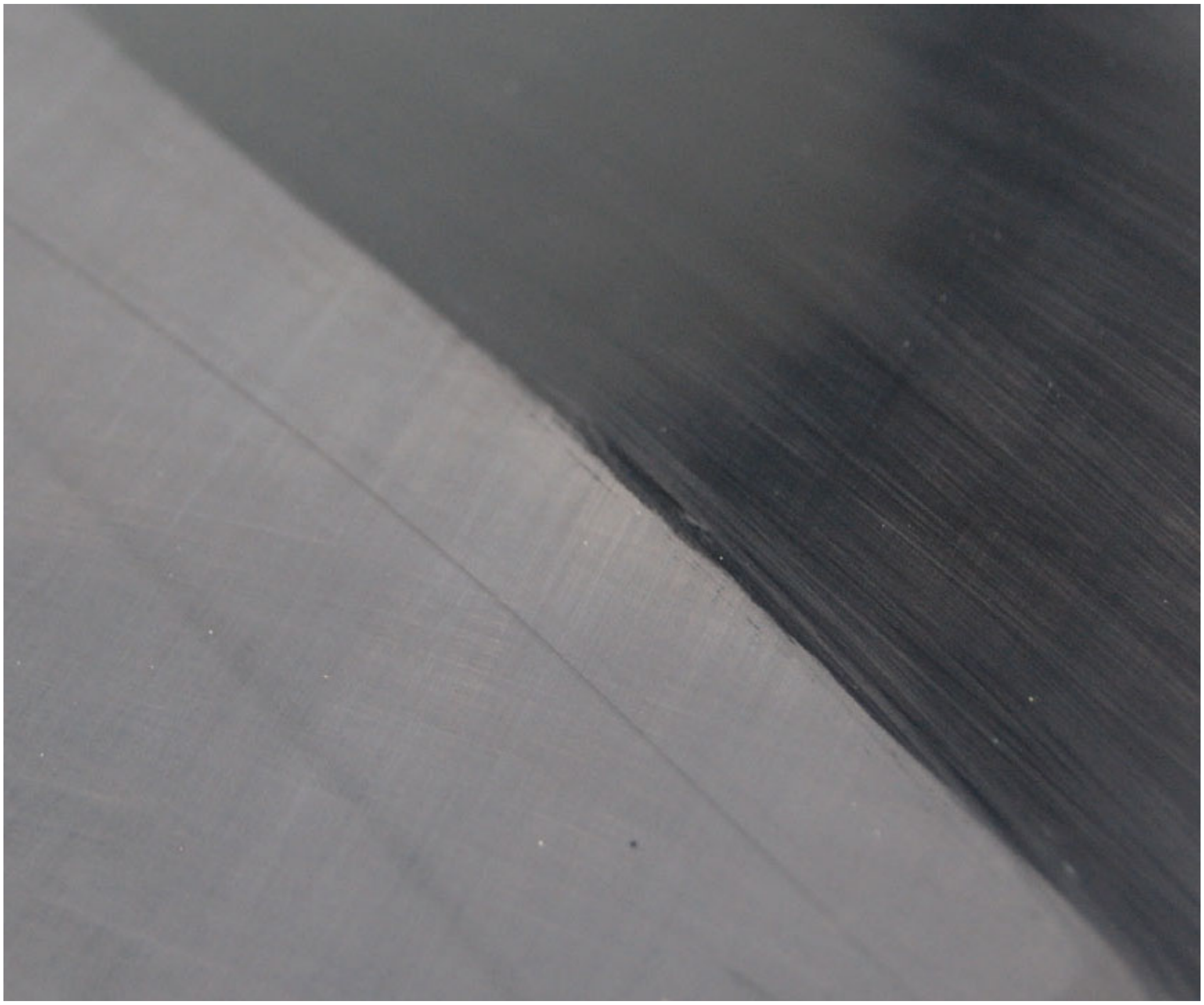
OTHER CONSIDERATIONS WHEN CHOOSING A PROTECTION PRODUCT

Gloss, ‘filling’ of the paint surface to hide defects, purity of finish and ease of use may be other factors to consider when choosing a protection product.

Gloss

Gloss is a measure of surface reflection, and denser, smoother coatings are likely to be unsurpassed in this regard (especially if the underlying surface has been machine polished ‘smooth’). This is why sealants can give a cold and ‘clinical’ shine, whereas natural waxes are warmer and less sterile in finish: the light is subtly diffused from the more uneven wax surface (this diffusion may also give the impression of extra ‘depth’ to the finish, so could be considered desirable). Gloss meters can be used to give an overall indication of gloss, but it should be noted that any coating over perfectly machine-polished paint has the theoretical capability of diminishing overall gloss by a miniscule amount – light has to travel through the coating and back out again, to reflect off the paint surface.

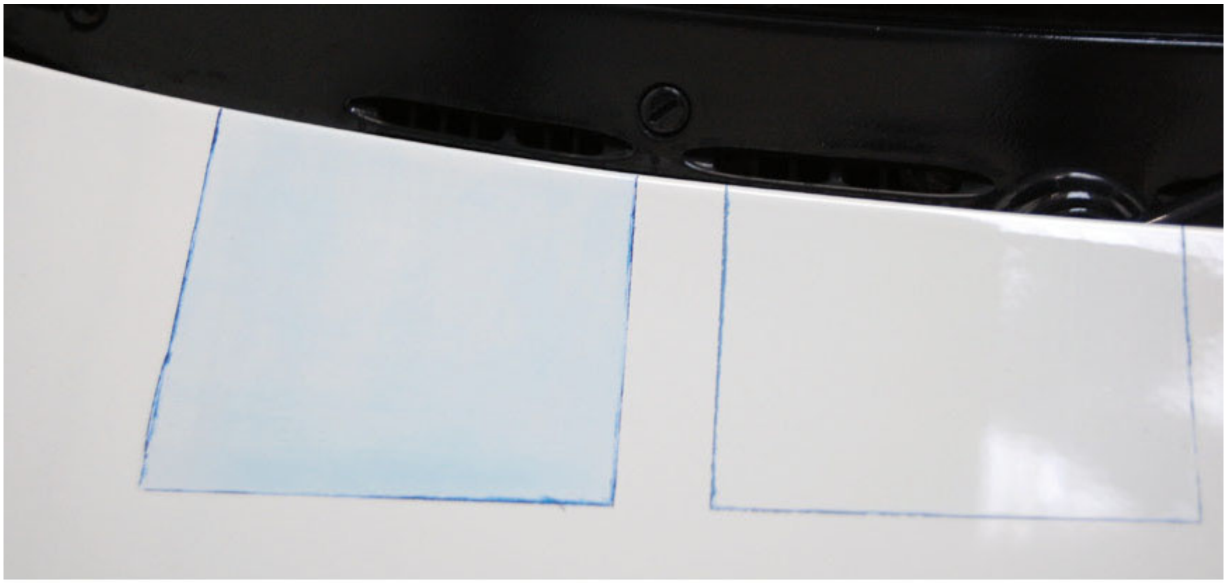
‘Filled’ Defects



This panel has been sanded, then partially covered in wax to demonstrate the 'filling' properties of this particular protection product upon initial application.

On 'regular' wash marred and unrefined paint, however, 'filled' defects can allow for a more reflective and linear surface, and thus give a better finish than would otherwise be the case. This filling effect can be seen relatively easily on a 2000–4000-grit sanded test panel (using a 50/50 technique), and it may even be seen on paintwork during 'live' application in certain circumstances.

Purity of Finish



Coloured waxes may tint paint by a few per cent; the effect is very subtle (especially on paintwork of a similar colour to the wax) but some detailers may perceive a benefit, especially on metallic or pearlescent finishes.

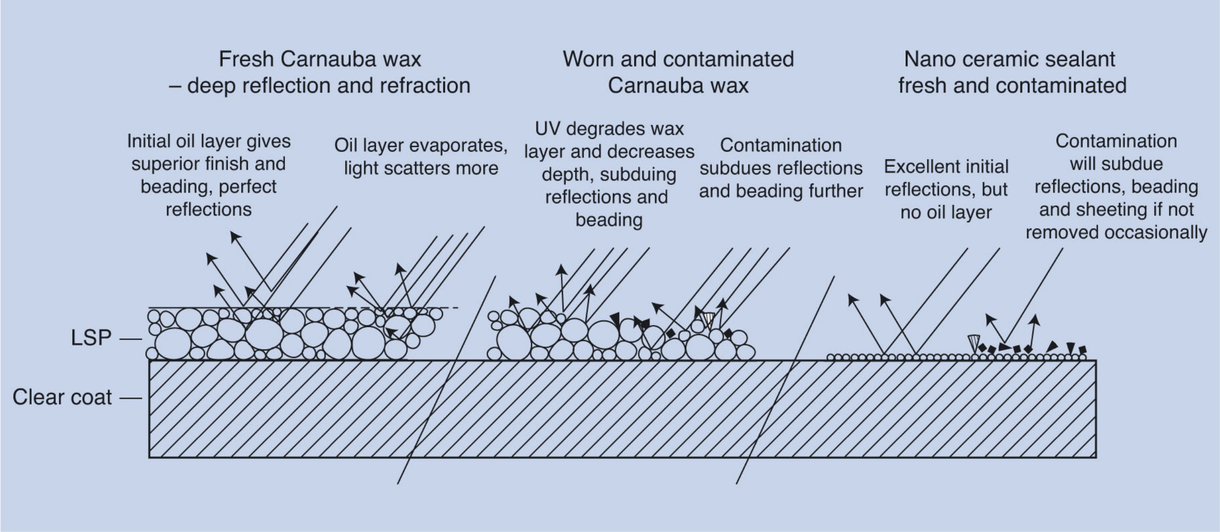
This is a measure of coating clarity/opacity and thickness. Thicker, opaque coatings diffuse light more as it travels through them to reflect off the underlying paint surface. Tinted waxes, or those with a stronger natural colour (some solvents may dissolve more of carnauba wax's natural yellow/brown colour, for example) are going to exhibit less optical purity, but in some cases the tint could create a pleasing effect, especially if the paint is a metallic or pearlescent type. Any tinge of colour can be seen by applying a few layers of the coating to a white-painted panel (ideally using a 50/50 technique). If a suitable car panel is not available, consider applying the wax or sealant to a washing machine, dishwasher or other electrical 'white goods' appliance (these could have an inferior, yet broadly similar, finish to white-painted cars).

Ease of Use

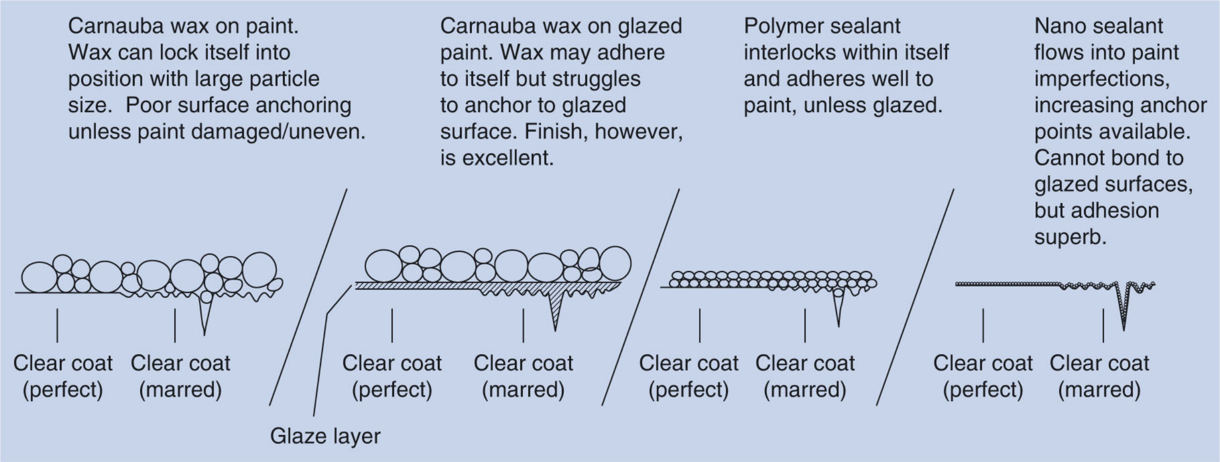
Finally, ease of use should be considered and assessed. If application and removal are simpler, more enjoyable and largely free from any 'issues' or side effects, then the product is more likely to give a good finish – although it should be noted that more durable or longer lasting products can be much more troublesome to use (but ultimately worth that extra ‘pain’).

In summary, there are few ‘rights’ or ‘wrongs’ when choosing protection products: it depends on what characteristics the user considers most important, and what role the product needs to play. A ‘show wax’ needs to be optically clear, but poor durability and longevity could be excused. Conversely, coatings on cars driven every day should be harder wearing, possibly at the expense of finish or ease of use. Probably the most important piece of advice would be to persevere with a product, rather than simply swapping it for an alternative at the first available opportunity. Too many detailers blame products for failings in performance, when the reality is that most modern protection products will perform well, if applied correctly. Get to know a product, learn how to apply it properly, and discover what its strengths and weaknesses are. If it still proves inadequate, only then exchange it for another product.

THE APPLICATION OF PROTECTION PRODUCTS


Fresh Carnauba wax
– deep reflection and refraction
Worn and contaminated
Carnauba wax
Nano ceramic sealant
fresh and contaminated
Initial oil layer gives superior finish and beading, perfect reflections
Oil layer evaporates, light scatters more
UV degrades wax layer and decreases depth, subduing reflections and beading
Contamination subdues reflections and beading further
Excellent initial reflections, but no oil layer
Contamination will subdue reflections, beading and sheeting if not removed occasionally
LSP
Clear coat

Reflection and refraction of protection products.


Carnauba wax on paint. Wax can lock itself into position with large particle size. Poor surface anchoring unless paint damaged/uneven.
Carnauba wax on glazed paint. Wax may adhere to itself but struggles to anchor to glazed surface. Finish, however, is excellent.
Polymer sealant interlocks within itself and adheres well to paint, unless glazed.
Nano sealant flows into paint imperfections, increasing anchor points available. Cannot bond to glazed surfaces, but adhesion superb.
Clear coat (perfect)
Clear coat (marred)
Glaze layer
Clear coat (perfect)
Clear coat (marred)
Clear coat (perfect)
Clear coat (marred)
Clear coat (perfect)
Clear coat (marred)

Anchor points in paint.

When applying a protection product, there are three main considerations:

- The nature of the coating/protection product being applied
- The nature of the surface the coating is being applied to
- The desired outcome in terms of maximizing finish, or longevity

The first consideration should always be the product itself. Read the label and any instructions; manufacturers want you to get the best from the product and minimize application errors, so they should offer some guidance. In general terms, waxes are unfussy products to apply, whereas the latest generation of ‘nano’ sealants are particularly challenging and require a solvent wipedown before being laid down.

Next, assess the surface. A very porous UV-damaged cellulose paint surface will require a different application technique to a brand new ceramic clearcoat; if left to cure for too long, ‘thinner’ (that is, more liquid) protection products may sink deeply into the paint and be difficult to ‘level’ to a consistent shine. If they then cure fully in an uneven manner a patchy finish may result, and that may be difficult to rectify.

Finally, you will need to make a choice between maximizing finish or maximizing durability and longevity. Waxes and sealants applied over heavy glazes will invariably be glossy and assist in ‘filling’ a washmarred surface, but they won’t be able to adhere to the paint as well as if it were solvent-wiped. A solvent wipe ensures that the microscopic pores in the paint surface can act as anchor points, free from existing oils, waxes or other residues.

APPLICATION OF A TRADITIONAL WAX (PASTE) BY HAND

When people think of protection products, they most likely have a paste wax in mind – typically and traditionally this will be a carnauba/beeswax blend, but many different waxes and ingredients can make up modern paste waxes. In general terms, paste waxes tend to be easy to use, being quite ‘unfussy’ in application, and deliver good results, with a strong filling/masking action, great hydrophobicity and moderate slickness/gloss.

You will need the following:

- A paste wax of choice
- A soft foam applicator (if required)
- A soft buffing cloth, folded into quarters to maximize the clean buffing area
- Some form of detailing spray, or even water spray if the wax has a high carnauba content

Ten-Step Method

Applying wax by hand is the preference of some detailers, although it can take longer than applying wax with a foam pad. There is also a small risk of marring soft paint with rough skin or jewellery – and also of over-applying the wax, which may increase curing time.

1. If you want maximum durability from the wax, it is best to apply it to ‘naked’ paint. Therefore you will need to give the paint surface a solvent wipe-down before you proceed – this will remove any oils, resins or other residues deposited during previous processes, such as polishing. Note that this may limit the finish achieved, but the durability and longevity of the wax will be maximized due to the availability of more microscopic ‘anchor points’ on the paint surface (*see* above).
2. If finish is to be maximized instead, simply ensure that the paint surface is clean, polished (glazed if required), cool and dry. Hot or wet surfaces may affect the curing of products so should be avoided. Likewise avoid hot or humid ambient application

conditions – hot temperatures see products cure prematurely, increasing the chances of a difficult and undesirable ‘dry’ buffing situation, and humid environments lengthen curing times by preventing outgassing of the solvents in the wax, as well as introducing moisture to the coating, which could cause adhesion or smearing issues.

3. You can apply paste waxes with your palms and fingertips, but only if your skin is soft (to guard against marring) and *not* sensitive. Waxes can be quite benign, but even the most natural waxes will contain some form of solvent that could crack or dry skin if exposure is prolonged. Those with allergies/sensitive skin should consider the use of nitrile gloves, because the chemicals within the product will be largely unknown and a wide variety of strong and sophisticated ingredients could have been used, despite an innocuous-looking label.

   The alternative is to use a soft foam applicator to apply the wax. These are preferable to microfibre applicators because they do not get clogged or ‘clump’ so easily (microfibre pile tends to hold on to the thicker wax rather than allowing it to spread fully). There is no real right or wrong as to the means of applying wax. As long as a thin, even coating is applied, with little or no chance of marring the paint, any type of applicator made from any kind of material will suffice. Be careful not to build up wax residue around badges or trim: this is difficult to remove at the time, and it can also attract dirt, and this may present a marring risk when removal is attempted later.
4. If using a foam applicator, dose it with a small amount of wax and spread the applicator pad over the surface under light pressure. The working area should be about 40 × 40cm, or larger (if comfortable). Either apply the wax in a circular motion, where each new ‘circle’ overlaps the last to ensure complete coverage and to allow the wax to be seen under a wider range of light conditions, or apply in straight vertical lines and then immediately do a second application set of straight horizontal passes (again, this helps to ensure even and complete coverage). If applying by the fingertips or palms, use whatever

technique feels comfortable to you (and the paint). Some apply with their flat palms as if initiating a massage, others will only use the ends of their fingers: the lack of absorbency and the warmth of the hands helps the wax spread on the paint surface successfully – although be aware that solvents may cause dryness or irritation to sensitive skin, and rough skin may also mar soft paint (use nitrile/latex gloves, if necessary). A circular or 'feathered' application method may make it easier to see the wax on the paint surface, aiding visual identification of covered areas.

   Note that there is little value in applying waxes thickly, despite the satisfaction that may be gained. Cured coats of wax are sub-micron in thickness, so if wax is visible on the paint at all, it has been applied to an adequate thickness. Thick coatings merely extend curing time, increase application issues (due to premature buffing/levelling, for example) and waste the product.

5. Allow for the wax to cure primarily. Use the manufacturer's instructions or labelling as a guide, but do not slavishly follow the prescribed curing time – there are simply too many variables. Instead, check for a change in the wax's appearance: uncured wax will often be greasy, reflective and slick to the touch, while primarily cured wax is generally dull or 'hazy' in appearance and 'stickier' in feel. Familiarity with the wax product will help you determine when it is primarily cured, and a 'swipe' test (where you swipe a soft microfibre cloth on the surface with your finger and see if it removes the visible residue cleanly) may prove useful.

   Some prefer the 'squeak' test, where a microfibre is twisted on the coating to see if it provides enough resistance to make some noise (uncured protection products will be too lubricated to 'squeak'), but this is not recommended: twisting any cloth into paint could potentially mar it, unless the material is extremely soft and completely uncontaminated. Once the coating is deemed to be cured, the visible residue can then be fully removed by buffing with a soft cloth, folded into quarters (or cloths – don't skimp on buffing cloths, and use as many as required to prevent residue being reapplied to the paint). Note that not all the wax is removed, just the residue, as there is a microscopic coating of (primarily cured) wax remaining on the surface after buffing, and it is this that provides the ongoing protection.

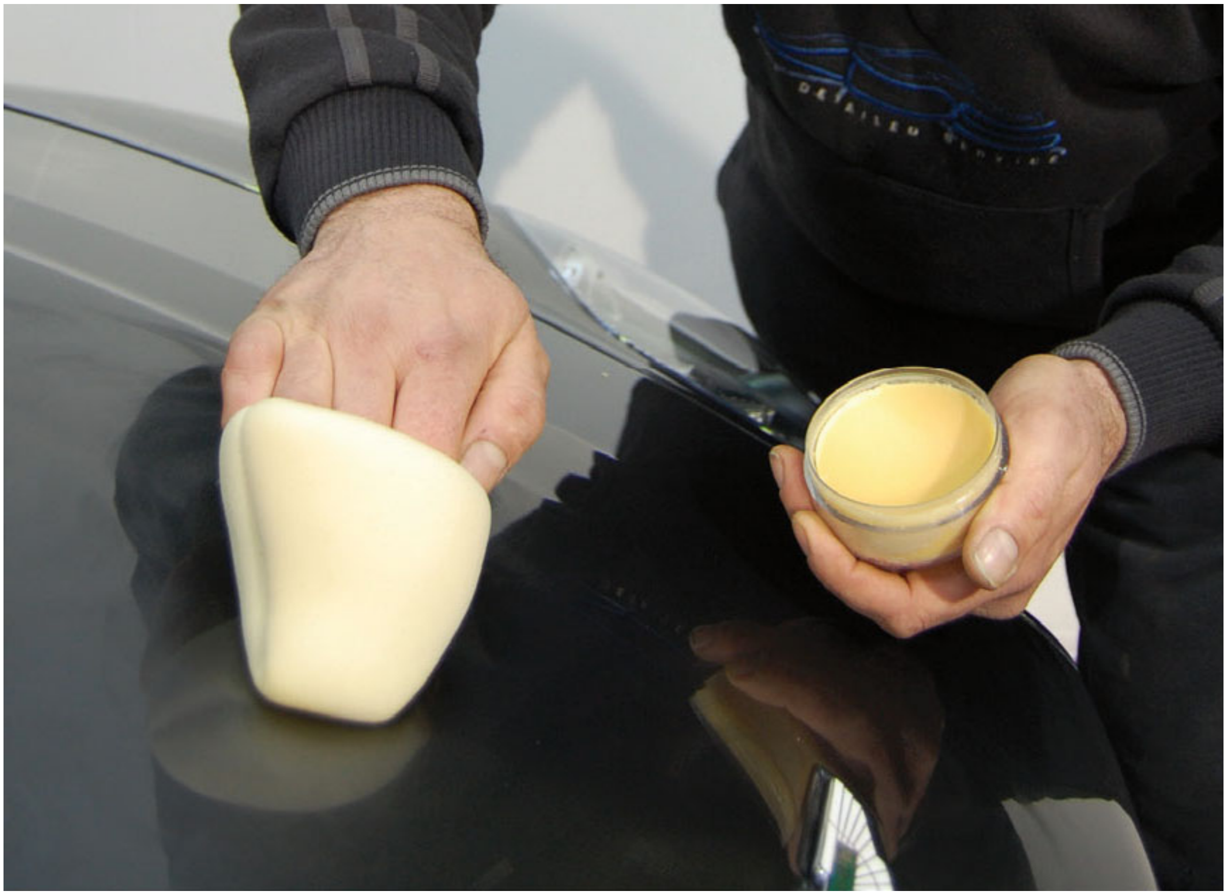
6. After primary curing, the wax should be left to sit for the same time again (the same amount of time as it took to primarily cure); this is to allow for any uncured wax on the buffing cloth that may have been inadvertently picked up during buffing also to cure primarily (otherwise hazing will be seen on the panel). Re-buff the panel with a soft cloth, ideally made of a microsuede material – the lack of pile makes it supremely effective at removing the final traces of oils or visible wax residues, but it would clog too easily if used for general buffing duties; conversely, long-pile microfibres, whilst soft, will sometimes 'drag' through oily residues rather than removing them.
7. If the visible wax residue is stubborn to remove, or if any dust or contamination has settled on the wax after application, use a mild water-based quick detailer. Apply the detail spray sparingly, and only apply to the paint under light pressure with a soft microfibre, to avoid possible interference issues.
8. Whilst a water-based quick detailer can 'spit shine' waxes heavy in carnauba, plain water can also be used (although this will not be able to lubricate contamination, so care should be taken to ensure that the surface is clean). Spit shining will only work with carnauba products and the effect is temporary, so it suits show preparation only. To spit shine a car, simply apply a fine mist of water to the carnauba wax after primary curing and buff it to a high shine immediately afterwards. Carnauba is hygroscopic and absorbs water, making it a denser material (and therefore more reflective) whilst it retains this moisture.

   Never try to spit shine carnauba with any kind of solvent, as the solvent will most likely strip the wax off the paint surface.
9. Secondary curing of the wax coating will take place within twenty-four to seventy-two hours after initial application (longer in colder or more humid conditions). During this time, the wax

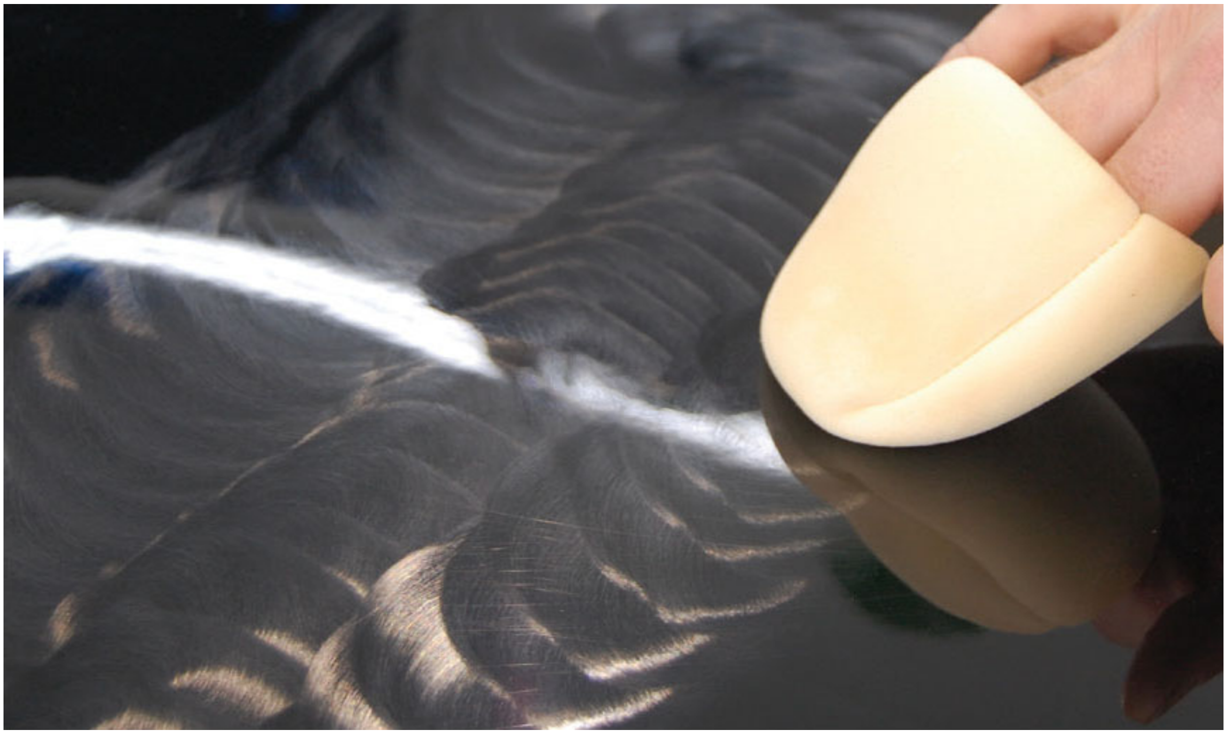
may still be microscopically ‘outgassing’ – solvents will be evaporating off – although 90–99 per cent of the outgassing will have taken place during the primary cure. The secondary cure cycle is of note simply because the wax will be unstable during this longer, final ‘setting-up’ stage. If attacked with solvents or conflicting products during this period, the wax could be damaged or entirely removed.

10. If you want to layer a wax, it would be advisable to do so in between primary and secondary curing. There should be little interference if it is applied after primary curing, but a better inter-layer bond should be achieved if applied before secondary curing has completed. Be careful not to seal in dirt between the layers (do not apply a secondary layer if the first layer is visibly contaminated). Should smearing or patching occur after attempting to buff the second layer, it is likely to have been applied too soon after the first layer. In this case, removal of both layers with a strong solvent may be the only course of action, followed by re-application of one or both layers (with a substantially longer curing time advised before application of the second coat).

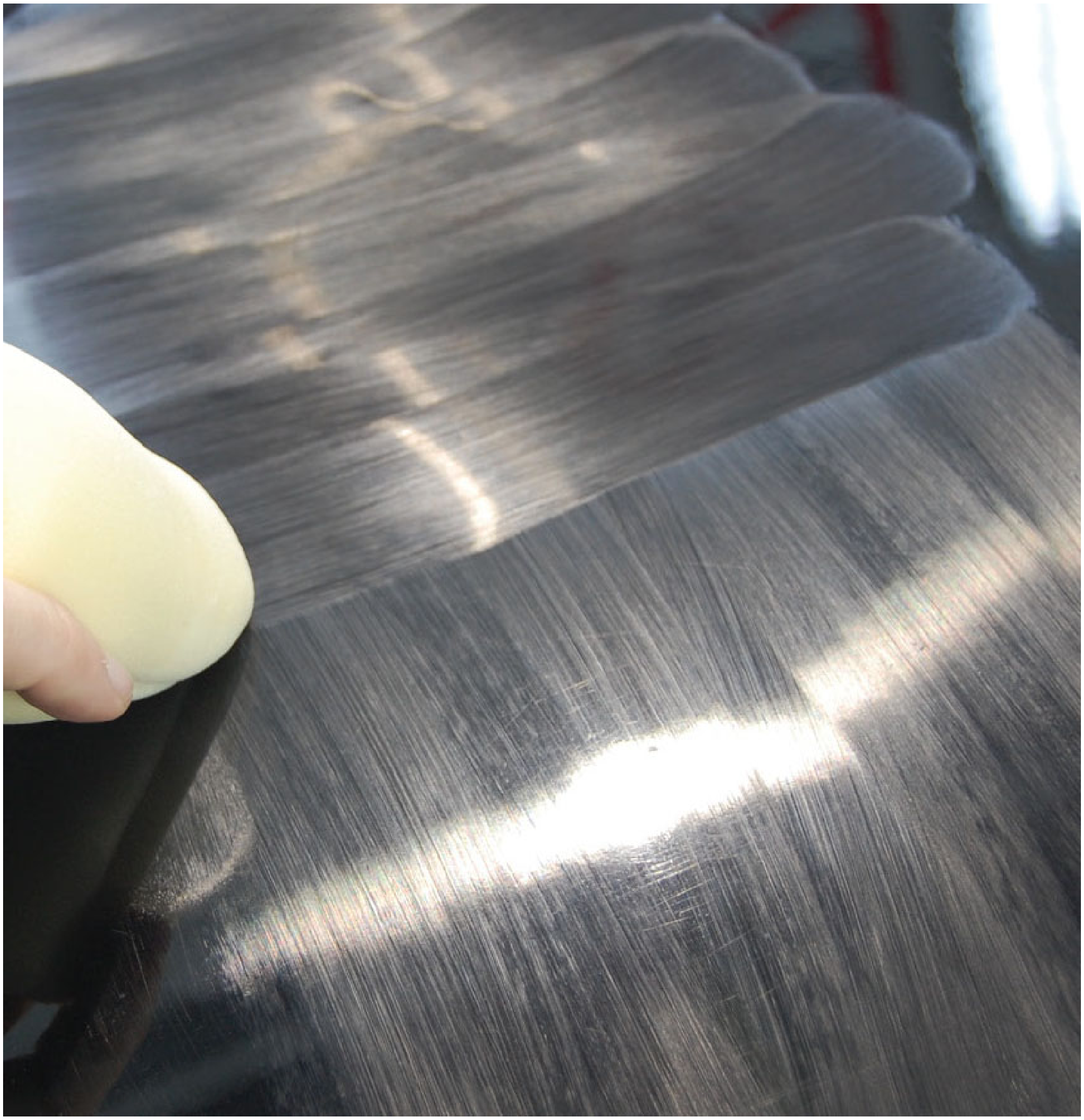
No guidance has been given as to whether to wax a part panel, a panel or the whole car before buffing; it really depends how many times you can wax a new ‘working area’ before the first area has primarily cured and the visible residue needs to be removed. Slower, methodical detailers in hotter ambient temperatures will probably need to wax/buff a panel at a time, whereas faster detailers in colder or more humid climates could potentially wax the whole car first.



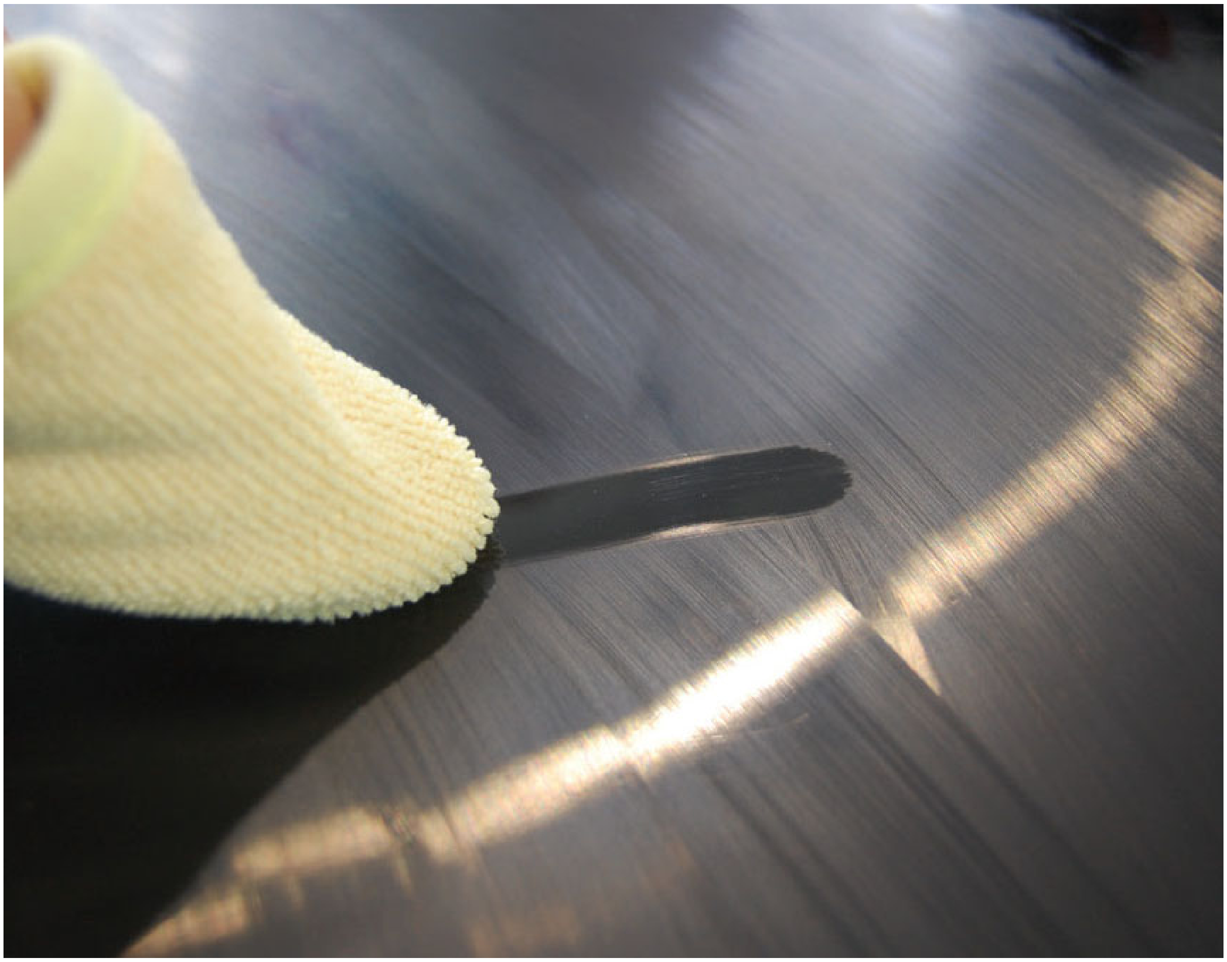
This 'finger-mitt' foam wax applicator has an internal seam to lower the chance of marring, and allows better 'feel' than standard round applicator pads.



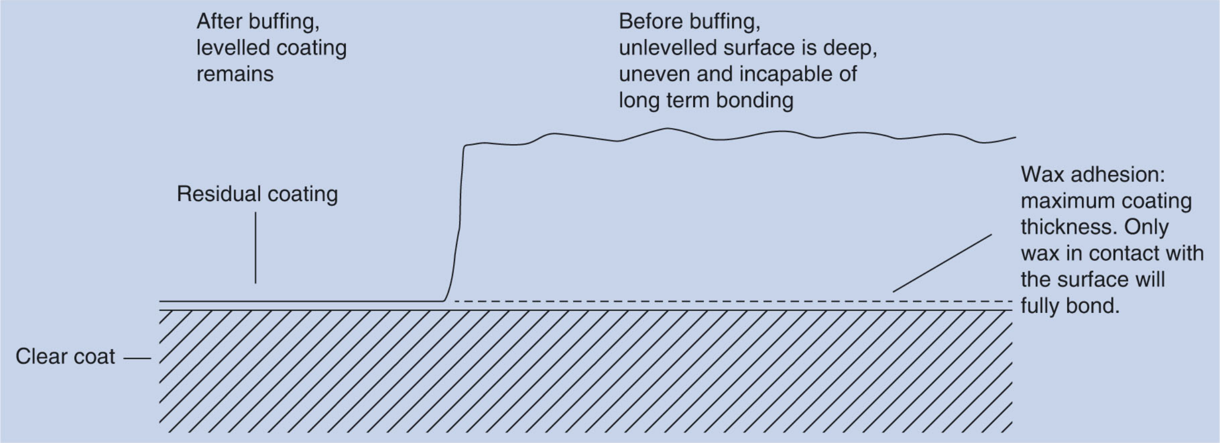
Applying wax in circular patterns highlights coverage because you can see where the wax has been applied from almost any viewing angle.



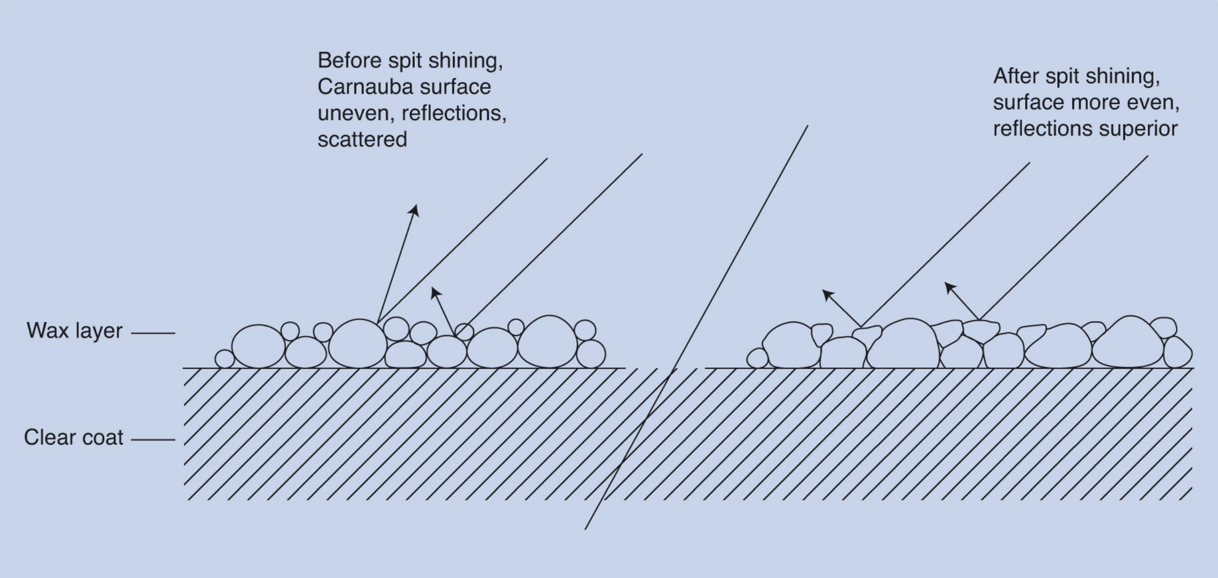
To ensure complete and even coverage you can apply two linear layers of wax: the first coat in one direction, then the second coat in the opposite direction.



The 'swipe test' may show when wax has primarily cured and is ready for buffing: wrap a finger in a microfibre cloth and drag it through the residue – the swiped pass should be clear and clean, rather than greasy.

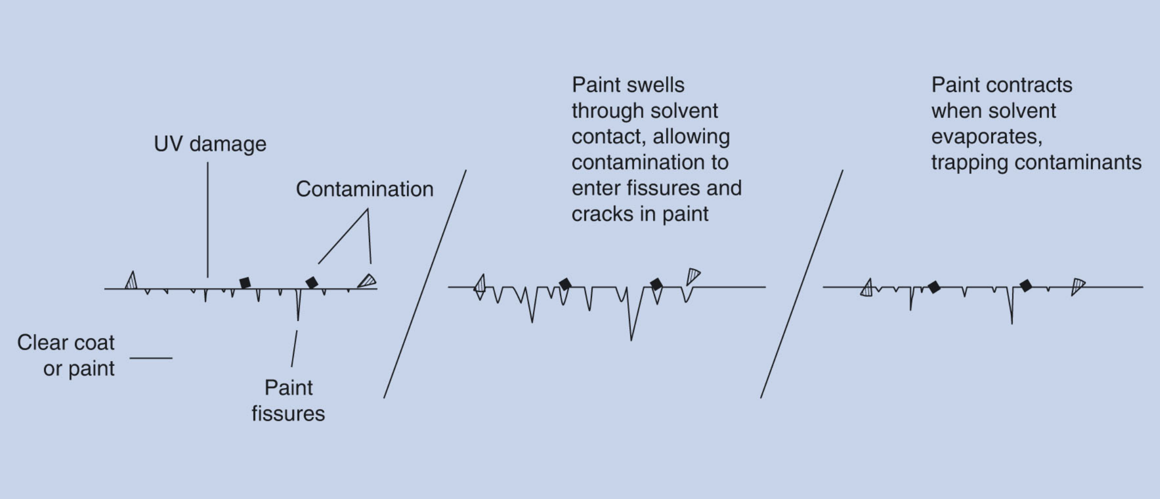

After buffing, levelled coating remains
Before buffing, unlevelled surface is deep, uneven and incapable of long term bonding
Residual coating
Wax adhesion: maximum coating thickness. Only wax in contact with the surface will fully bond.
Clear coat

Buffed residue versus residual coating.



Spit shining a carnauba wax.

SOLVENT STRENGTH VERSUS SENSITIVE FINISHES: WHY CLASSICS LOVE CARNAUBA



Swollen paint trapping contaminants.

Softer cellulose paints, as found on many vintage cars, need to be coated with more delicate protection products than normal. Whilst high performance sealants offer many advantages over ‘standard’ carnauba waxes, they invariably use a much more aggressive solvent as a carrier. Gentler solvents simply can't dissolve the durable synthetic ingredients successfully. On a modern clearcoated finish there is little to worry about, as the sealant applies in a similar manner to a standard wax, with no adverse effects. However, on soft cellulose finishes, strong solvents may weaken the (solventbased) paint and cause it to swell.

As well as a small paint removal/damage risk, there is also a chance that water marks or dirt could be trapped within the swollen paint: when the paint dries out again due to solvent evaporation, the cracks and pores in the paint may contract around the contamination particles present on the surface, locking them in. In these cases, the contamination may prove difficult to remove subsequently, and if a detail spray, polish or clay bar is ineffective, a harsher chemical treatment (a strong solvent wash or acid rinse) may need to be employed. Failing that, the only option will be to remove the contamination by machine polishing/wet flatting.

Note that two-pack (epoxy) paints and modern clearcoats will not normally be affected by strong solvents in this way, and that solvent strength needs to be assessed on an individual basis. Some sealants contain mild solvents and will be fine, whereas some carnauba waxes may have a strong (volatile) solvent within. As a general rule, any product (wax, polish, tar remover or otherwise) with a strong solvent smell is going to present a certain risk to cellulose paint. If there is no strong solvent smell present, then the chances are that the product uses a very mild solvent and will therefore be more suitable. A simple 'sniff' test is helpful here, but be careful, as inhaling strong solvents can kill – and be mindful that strong limonene/orange-oil solvents smell benign, and other products may contain fragrances to mask the smell of stronger solvents, making the solvent strength harder to assess.

APPLICATION OF A TRADITIONAL LIQUID SEALANT BY HAND

Whilst it has been noted that distinguishing between ‘waxes’ and ‘sealants’ may be a relatively fruitless exercise, it is still understood that most detailers will divide protection products into basic types, such as paste carnauba waxes and liquid synthetic sealants. These sealants, if of a traditional formulation, will normally be based on silicone polymer or acrylic polymer technologies. The way they are applied to paint is similar to the application technique for ‘substantially natural’ paste waxes, but there are a couple of points to note. Firstly, the solvent within liquid sealants may be stronger, so care must be taken with cellulose finishes (*see* above); and secondly, a sealant coating can have a denser and more uniform molecular structure than that of a natural wax, so it repels contamination more than absorbing it (it is more of a repellent layer than a sacrificial layer). As with waxes, the exact application method depends on ambient factors and what kind of results are required; durability and longevity can be boosted by applying the sealant on to solvent-wiped ‘naked’ paint.

You will need the following:

- A sealant of choice – a traditional silicone or acrylic polymer protection product, rather than a modern ‘nano’ or ‘ceramic’ sealant
- A soft foam applicator or microfibre-covered foam pad
- A soft buffing cloth
- A detailing spray

Eight-Step Method

1. If you want maximum durability from the sealant, it is best to apply it to ‘naked’ paint. Therefore you will need to give the paint surface a solvent wipe-down before you proceed (this will remove any oils, resins or other residues deposited during previous processes, like polishing). Note that this may limit the finish achieved, but durability and longevity of the sealant will

be maximized due to the availability of more microscopic ‘anchor points’ on the paint surface.

2. If the finish is to be maximized instead, simply ensure that the paint surface is clean, polished (glazed if required), cool and dry. Hot or wet surfaces may affect the curing of products so should be avoided. Likewise avoid hot or humid ambient application conditions – hot temperatures see products cure prematurely, increasing potential buffing problems, while humid conditions lengthen curing times by preventing the outgassing of the solvents in the wax (as well as introducing moisture to the coating, which could cause adhesion issues or prevent polymer sealants cross-linking successfully).
3. Use a soft foam applicator or microfibre-covered foam pad to apply the liquid sealant. Application by the palms of the hands or the fingertips is not recommended due to the likelihood of a more aggressive solvent being present. Dose it with a little sealant and spread the applicator pad over the surface under light pressure. The working area should be about 40 × 40cm, or larger (if comfortable). Either apply the sealant in a circular motion, where each new ‘circle’ overlaps the last to ensure complete coverage, or apply in straight vertical lines and then immediately do a second application set of straight horizontal passes (again, this helps ensure even and complete coverage). As with waxes, there is no value in applying sealants thickly. Sealant coatings will be sub-micron in thickness, so if the product is visible on the paint at all, it has been applied to an adequate thickness. Thick coatings merely extend curing time, increase application issues (due to premature buffing/levelling, for example) and waste the product.
4. Allow for the sealant to cure primarily. Use the manufacturer’s instructions or labelling as a guide, but do not slavishly follow the prescribed curing time – there are simply too many variables. Instead, check for a change in the appearance of the sealant: the uncured product will be greasy, reflective and slick to the touch, while the primarily cured product is often dull or ‘hazy’ in appearance and ‘stickier’ in feel. Familiarity with the product will help you determine when it is primarily cured, and a

‘swipe’ test (where you swipe a soft microfibre cloth on the surface with your finger and see if it removes the visible residue cleanly) may prove useful. The visible residue can then be fully removed by buffing with a soft cloth: fold it into quarters and use a fresh ‘side’ when the first quarter becomes saturated with buffed residue – you don’t want to reapply residue to the coating, as it could create secondary hazing. Note that not all sealant is removed during buffing, just the residue, as there is a microscopic coating of (primarily cured) sealant remaining on the surface afterwards; this provides the ongoing protection.

5. After primary curing, the sealant should be left to sit for the same time again (that is, the same amount of time as it took to cure primarily). This is to allow for any uncured product on the buffing cloth (which may have been inadvertently picked up during buffing) also to cure primarily (otherwise hazing will be seen on the panel). Re-buff the panel with a soft cloth, ideally made of a microsuede material – the lack of pile makes it supremely effective at removing the final traces of oils or visible sealant residues, but it would clog too easily if used for general buffing duties.
6. If the visible sealant residue is stubborn to remove, or if any dust or contamination has settled on the sealant after application, use a mild water-based quick detailer. Apply the detail spray sparingly, and only apply it to the paint under light pressure with a soft microfibre, to avoid possible interference issues. If the residue cannot be removed easily with a quick detailer, a re-application of the sealant to the affected area may ‘re-wet’ it enough for it to be immediately buffed/levelled.
7. Secondary curing of the sealant coating will take place within twenty-four to seventy-two hours after the initial application (longer in colder or more humid conditions). During this time, the sealant may still be microscopically ‘outgassing’ (solvents will be evaporating off), although 90–99 per cent of the outgassing will have taken place during the primary cure. The secondary cure cycle is of note simply because the sealant will be unstable during this longer final ‘setting-up’ stage. If attacked with solvents or conflicting products during this period,

the sealant layer could be damaged or entirely removed. For example, it is important not to allow cross-linking polymer sealants to get wet during this extended setting-up period. The water droplets can prevent robust and complete cross-link bonds from forming.

8. If you want to layer a sealant, you would be advised to do so between primary and secondary curing. There should be little interference if it is applied after primary curing, but a better inter-layer bond could be achieved if it is applied before secondary curing has completed.

Once again, no guidance has been given as to whether to apply sealant to a part panel, a panel or a whole car before buffing; it really depends how many times you can seal a new ‘working area’ before the first area has primarily cured and the visible residue needs to be removed. Slower, methodical detailers in hotter ambient temperatures will probably need to seal/buff a panel at a time, whereas faster detailers in colder or more humid climates could potentially seal the whole car first. Sealants may cure faster and harder than waxes (due to more volatile solvents and higher levels of coating adhesion), so be cautious. It is better to remove a sealant a little earlier and experience a mild decrease in longevity/durability than for it to set hard with a smeary or inconsistent finish that cannot be easily rectified.

Matt finishes are sometimes fashionable, but can be difficult to maintain from a detailing perspective.

MATT FINISHES: AVOID COATING THE ROUGH WITH THE SMOOTH

Matt finishes, whether in the form of a vinyl wrap or original paintwork, enjoy popularity when in fashion, but from a detailing perspective they present a unique challenge. Almost all detailing products are designed to increase gloss, and virtually every product that leaves behind a protective residue is going to ‘fill’. This means that the vast majority of polishes, glazes, waxes and sealants on the market – let alone quick detailers or glossenhancing shampoos – are going to affect the matt finish.

So how do you protect the finish? Or do you even need to? Well, firstly, there is perhaps less reason to protect matt finishes because they cannot visually deteriorate to the same degree as gloss finishes – typically these go matt from surface degradation, and a matt finish is effectively ‘pre-degraded’ by nature. And if it is matt vinyl, rather than matt paint, the vinyl is cheap and easy to replace; also it is a protectant itself, guarding the underlying paint from damage.

That said, it would be remiss to avoid or ignore the issue of matt finish protection. Every surface can – and perhaps should be – protected: after all, vinyl is soft and a coating may help prevent it from picking up light scratches or surface contamination, or stop it from becoming faded or UV degraded.

Preparing and protecting matt finishes differs considerably to the techniques and products used for gloss finishes: the pre-wash, wash and decontamination stages will be identical (except for claying), but no polishing or glazing will be necessary – and could even be detrimental to the finish – and protection must be of a suitable nature (non-gloss-enhancing). Invariably this means an application of a protection product with some form of solvent wipe-down beforehand, as detailed in the relevant sections of this book. The problem is simply finding a suitable protection product, because so few exist. Even products manufactured and marketed as being suitable for matt finishes can sometimes give matt paint a ‘satin’ finish when actually tested. The best products for the task are likely to be from the ‘spray nano sealant’ family, and the solvent strength of these would suggest caution on printed unlaminated vinyl and very soft paint finishes (although they should be fine on normal matt vinyl and harder types of matt paint). Ultimately, it will be a job for the individual detailer to research, test and choose a suitable product.

APPLICATION OF MODERN NANO-CERAMIC SEALANTS BY HAND

Nano-ceramic sealants offer excellent durability and longevity but can be tricky to apply, expensive to purchase, and don't 'fill' imperfect paint finishes very well. This picture shows a large piece of crystalline residue left behind after solvent evaporation/product curing.

Nano-ceramic sealants come in many different formulations and may use different technologies, so it is difficult to give highly specific application advice. However, they invariably require a completely 'naked' (panel-wiped) surface to maximize their adhesion – or even to work at all. This means that they can’t be applied straight after regular hand polishing, and glazes are completely out of the question. With this in mind, it must be realized that the best finish can only be attained with a nano-ceramic sealant if the paint is machine-polished first, and then thoroughly (and carefully) solvent-wiped afterwards to ensure no glaze oils have been left behind. If you aren’t machine polishing, you may get a better finish by using a more traditional process of polish > glaze > wax. However, the durability and longevity of nanoceramics can be vastly superior to organic waxes, and they may also be highly resistant to scratching or certain contaminants (in comparison to the softer and ‘rougher’ layer presented by wax).

So is it really worth going to the expense and hassle of applying a nano-ceramic sealant versus the ease and low cost of applying a more traditional protection product? As with most discussion points in the world of detailing, there is no particular right or wrong answer. It just comes down to individual circumstances, specific requirements and personal preference.

You will need the following:

- A nano-ceramic sealant of choice
- A lint-free applicator or application cloth
- A soft buffing cloth
- A lint-free (for example microsuede) final buffing cloth

Ten-Step Method

1. Nano-sealants must be applied to ‘naked’ paint (much of their durability and longevity can be attributed to the better adhesion afforded by a small particle size). Therefore you will need to give the paint surface a solvent wipe-down before you proceed (this will remove any oils, resins or other residues deposited during previous processes, such as polishing). Note that this may limit the finish achieved; on swirlmarked or wash-marred cars, a better finish may be achieved using a classic polish and wax process.
2. Use a soft lint-free applicator or lint-free cloth to apply the liquid sealant. Nano-sealants may contain strong solvents, so a soft

lint-free material will help prevent accidental marring or linting. Cotton wool make-up pads are sometimes used to apply nano-sealants, and these may be acceptable on harder paint surfaces but on softer paints they could present a marring risk. Do not apply nano products by the palms or the fingertips, and wear nitrile gloves if required. Suitable eye, inhalation and hand protection is generally unnecessary for more traditional products, but nano-ceramic sealants may need more care and caution during application. The absorptive qualities and filaments of soft microfibres are ideal for nano-sealant application: the fibres help the microscopic particles 'brush into' cracks and crevices on the paint surface, aiding adhesion and curing.

3. Consult the manufacturer's application instructions or the label, and ensure that you are familiar with the application method supplied, and that the ambient/application conditions are suitable. Nano-sealants tend to be more complicated to apply, and less forgiving if application is carried out incorrectly.
4. Assuming that there is no conflict with the manufacturer's prescribed application method, dose the applicator pad or cloth with a small amount of nano-sealant and spread the sealant over the paint surface under light pressure. The working area should be about 40 × 40cm, or larger if comfortable. Either apply the sealant in a circular motion, where each new 'circle' overlaps the previous one to ensure complete coverage, or in straight vertical lines, then immediately applying a second set of straight horizontal passes (again, this helps ensure even and complete coverage).

   There is no value in applying nano-sealants thickly. Unless it is a crystalline resin sealant system, the coating will be sub-micron in thickness, so if the product is visible on the paint at all, it has been applied to an adequate thickness. Thick coatings merely extend curing time, increase application issues (leading to an uneven or 'unlevelled' finish, for example) and waste the product.
5. Allow for the sealant to primarily cure, and then buff. Use the manufacturer's instructions or labelling as a guide, but be wary

of slavishly following the prescribed curing time – there are simply too many variables. Note that some nano-sealants may show very few signs of primary curing at all, and this makes judging the buffing time exceptionally difficult. In these instances, buff the product according to the manufacturer-supplied instructions (or slightly earlier than recommended, if you are being cautious).

6. After primary curing/buffing, let the nano-sealant sit for the same time again (the same amount of time as it took to cure primarily) to allow for any uncured product on the buffing cloth, which may have been inadvertently picked up during buffing, also to cure primarily. Re-buff the panel with a soft, microsuede lintfree cloth.
7. If smearing or ‘patching’ is visible, the coating may have cured before having been fully levelled. If this occurs, reapply the nano-sealant immediately to the affected area to ‘re-wet’ it enough for it to be buffed/levelled successfully. Should this be ineffective, the nano-sealant may need to be subsequently removed, or masked by a traditional polish, glaze or wax. You may be surprised how effective it is to apply a wax straight over a patchy nano-sealant finish: whilst this is never necessarily the best course of action, it may prevent the need to remove the sealant and repeat the protection process from the beginning (an unenviable task!).
8. Never apply a nano-sealant to the whole car before buffing. Due to fussy application and removal, always apply the product to a panel (or part panel) at a time, then buff and make good before moving on to the next section.
9. Secondary curing of the nano-sealant coating will take place within twenty-four to seventy-two hours after initial application (longer in colder or more humid conditions). During this time the sealant may still be microscopically ‘outgassing’ (solvents will be evaporating off), although 90–99 per cent of the outgassing will have taken place during the primary cure. The secondary cure cycle is of note simply because the sealant will be unstable during this longer final ‘setting-up’ stage. It is important not to allow the sealed surfaces to get wet during this

extended setting-up period, especially if it is hard water from a hosepipe, rather than ‘soft’ rain water.

Besides inhibiting secondary curing, the hard-water droplets will contain calcium carbonate, an alkaline substance, and this can etch into susceptible nano-coatings (which tend to be acid-based). Should water-spot etching take place during secondary curing, the marks that result will be very difficult to remove because they will be within the nano-sealant layer, a layer that is often far harder than the paint itself.

10. If you want to layer the nano-sealant (two coats may be good for coverage, but there would be little point applying additional coats because the microscopic anchor points that the sealant uses for adhesion would already have been used), it would be advisable to do so between primary and secondary curing. There should be little interference if an additional coat is applied after primary curing, but a better inter-layer bond could be achieved if it is applied before secondary curing has completed.

APPLICATION OF WAXES AND SEALANTS BY MACHINE

Some waxes are specifically designed for machine application; these may contain more beeswax to prevent them breaking up when the pad is loaded by machine.

Unlike the polishing process, which hugely benefits from the action of a machine, applying a wax or sealant can be completed successfully by manual means (waxes and sealants simply need coverage, not abrasion). Machine application is unnecessary, and it could even be counter-productive in some instances. Therefore, applying a wax or sealant by hand should always be seen as the 'norm' and it should be accepted that machine application of waxes or sealants is an advanced technique only suitable for some detailers in certain circumstances. For completeness, the process will be described here.

You will need the following:

- A wax or sealant (if using a paste wax, it may be easier to use a firmer wax that will ‘pop’ out of the container)
- A machine polisher and suitable backing plate
- An ultra-fine or fine-cut foam finishing pad
- Soft microfibre(s) for buffing the residue

Seven-Step Method

1. Ensure the paint surface is suitably prepared – polished and glazed to maximize the finish, or solvent-wiped to maximize durability/longevity.
2. If using an orbital polisher, apply wax or sealant to the pad until the coverage is moderate and consistent. If using a rotary polisher, affix the pad and backing plate to the machine first, and then, for sealants, apply a generous dose to the pad; for paste waxes, tap the wax out of its container or use a dedicated ‘machine applied’ wax, and load up the pad like a potter’s wheel: turn the machine on its side, and operate at low rpm, letting the wax rub against the pad until an even coverage is achieved.
3. Spread the wax/sealant at low rpm with light pressure over the paint surface; do not exceed 1,200rpm or let the pad get too hot. Do a complete panel at a time, or two small panels if practicable. With practice, this method could prove faster than hand-applying a protection product.
4. Allow the wax or sealant to cure primarily, and then buff by hand with a soft cloth. Do not carry out this ‘first’ buff by machine unless using a twin-head contra-rotating machine such as the Cyclo: these machines can use a full-size microfibre for buffing, placed over the contra-rotating heads in a ‘nappy’ or ‘diaper’ arrangement. Standard machine-polishing bonnets made from microfibre will not be able to absorb all the residue successfully, and are more likely to spread fresh residue on the panel inadvertently, causing rehazing (*see* above).
5. Once buffed by hand, carnauba waxes can be lightly misted with water and then machine buffed using an orbital or rotary

machine with a microfibre bonnet. Again, low rpm and light pressures should be used. Heat or cut of any kind is likely to damage the wax layer. Sealants may also be successfully machine buffed using a spray of quick detailer rather than water, but experimentation is essential. Most waxes and sealants will see no benefit from machine buffing, and may even be removed or prevented from curing properly.

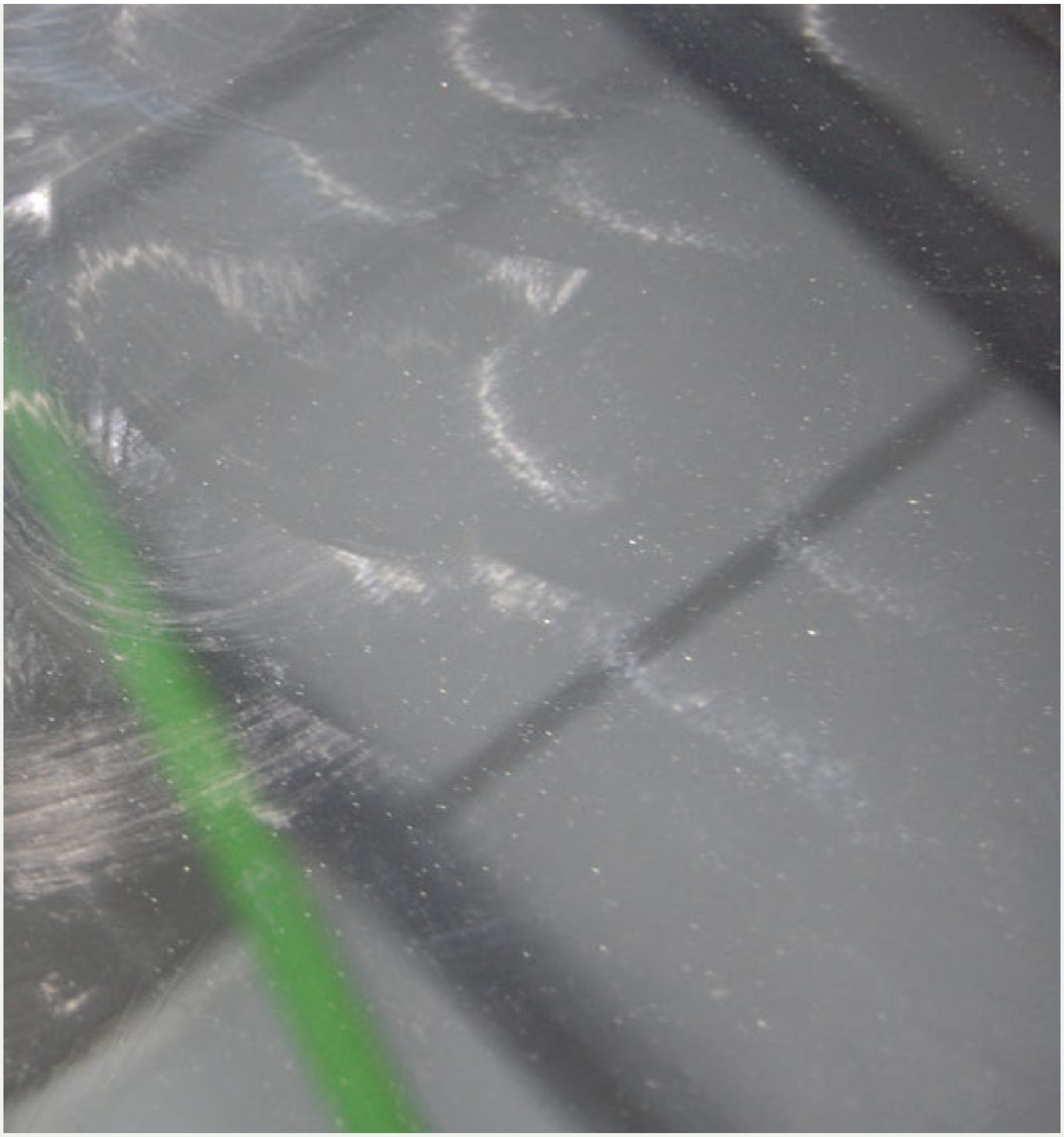
6. Repeat Steps 3 to 5 on the remaining panels.
7. When machine application/buffing is complete, re-buff all panels with a soft microsuede lintfree cloth if any rehazing is seen.

Twin-head contra-rotating orbital machines are uniquely suited to buffing; a microfibre cloth can be folded around the polishing heads like a nappy (diaper).

PROBLEMS WITH PROTECTION PRODUCTS: COMMON WAX/SEALANT APPLICATION ISSUES

Waxes and sealants attract a lot of commentary on internet forums, especially in terms of application and results. Whilst some users have a positive experience with a certain product or find its application straightforward, others may feel disappointed with the finish/performance, or may find the application process difficult or frustrating. Here is a short guide to the common application issues, and why they may arise.

Patching/smearing/oil holograms



Oil holograms, smearing and patching are all potential side effects of wax or sealant application; these oil holograms are caused by an over-application of wax and incomplete buffing.

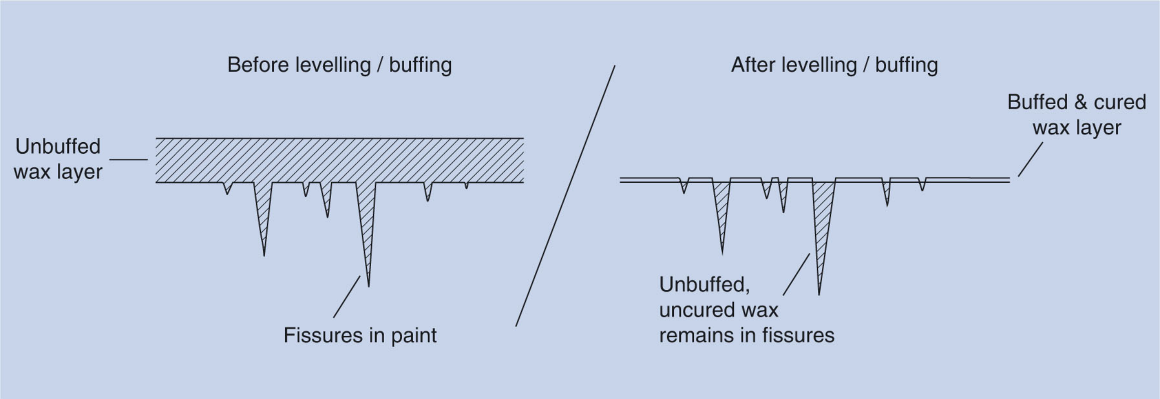
Patching and smearing impairment is when the finish demonstrates inconsistent gloss, with some areas being shinier than the others, creating a smearing or hologram effect.

This can be caused by a number of seemingly contradictory reasons:

Leaving the protection product to overcure (it has been left too long before buffing): The product will cure in high and low levels inconsistently across the paint surface, creating an optical patching/smearing effect. However, because it has now fully cured it is difficult to level through regular buffing. The solution is to apply more of the product or a quick detailer to re-wet it, and then rebuff. If this fails, removal of the product (using a strong solvent, perhaps) and subsequent reapplication could be the best option.

Buffing an undercured protection product (the product has not been left long enough before buffing): If the product is buffed when it has not primarily cured, wet product will be spread by the buffing cloth. Whilst it may then appear to be removed, a microscopic coating of fresh product will have been inadvertently spread on the paint surface. Thinking that the product has been buffed, the detailer will now leave the product to cure without properly levelling it. This can lead to mild hologramming/patchiness, or at the very least, dullness or hazing (the residue that would normally be removed by buffing). Carrying out a secondary buff during the suggested application technique above will largely prevent this issue. If you manage to catch the hazing or patching early on, a simple buff may be all that is required.

If you find the effect hours or days later when it is difficult to remove, try re-wetting the product and rebuffing, or remove it completely and reapply/rebuff correctly.


Before levelling / buffing
Unbuffed wax layer
Fissures in paint
After levelling / buffing
Buffed & cured wax layer
Unbuffed, uncured wax remains in fissures

Sunken protection product on UV-damaged paint.

UV-damaged paint: If the paint has become porous (a particular problem with the upper surfaces of red or dark-coloured single-stage paints on older vehicles) then the protection product will sink into the paint beyond the 'buffing depth' and it will cure with no hope of being levelled. If this occurs, application of an oily glaze may provide a temporary and consistent gloss finish, but removal of the product (say, with a strong solvent) may be the only option. It is recommended to then machine polish the paint to a point beyond the damaged depth, or even (in extreme cases) to fully repaint the panel, before applying a protection product. Almost any product (bar the oiliest glazes) applied to porous UV-damaged paint is likely to lead to an inconsistent finish.

Product interference: If an incompatible product is applied to an existing coating, it may destabilize the lower layer or prevent the upper layer from curing properly. This may lead to strange curing characteristics, and the chance of smearing/patchiness will massively increase. If the 'hybrid' coating can be successfully buffed, do so – otherwise it will have to be removed, and a product (or compatible products) reapplied. Note that product interference is most likely before primary curing and somewhat likely during secondary curing of the lower layer. Once secondary curing has completed, the lower layer will be fundamentally stable and only the strongest processes or products are likely to affect it.

Rehazing

Rehazing generally occurs when an undercured protection product – it has not been left long enough before buffing – is buffed: this is a particular issue with very high carnauba content waxes, or products applied in humid or cold climates when curing may take far longer than expected. If the product is buffed when it has not primarily cured, wet product will be spread by the buffing cloth. Whilst it may then appear to be removed, a microscopic coating of fresh product will have been inadvertently spread on the paint surface. Thinking that the product has been buffed, the detailer will now leave the product to cure without properly levelling it. This leads to a hazed residue, as seen at the primary curing stage.

Rehazing may also occur in extremely hot climates on dark-coloured cars when carnauba coatings have been previously applied – the carnauba wax may have a relatively low melting point and remelt due to ambient or panel temperatures. This may cause rehazing in itself, but if the panels are touched or treated (perhaps due to the application of a quick detailer, strong detergent or car shampoo) then the carnauba coating may be disturbed and rehaze later.

Condensation

If applying wax or sealant products in humid conditions (notably at dusk or dawn) then the temperature change on the panel caused by the product outgassing may result in condensation (the effect will most likely be seen during primary curing, but could also occur during secondary curing). This condensation may look like hazing, but is in fact just a visual effect caused by thousands of microscopic water droplets. These can usually be removed quite simply by buffing again with a soft and absorbent cloth. To avoid causing extra work for yourself, avoid applying a protection product at dusk or dawn.

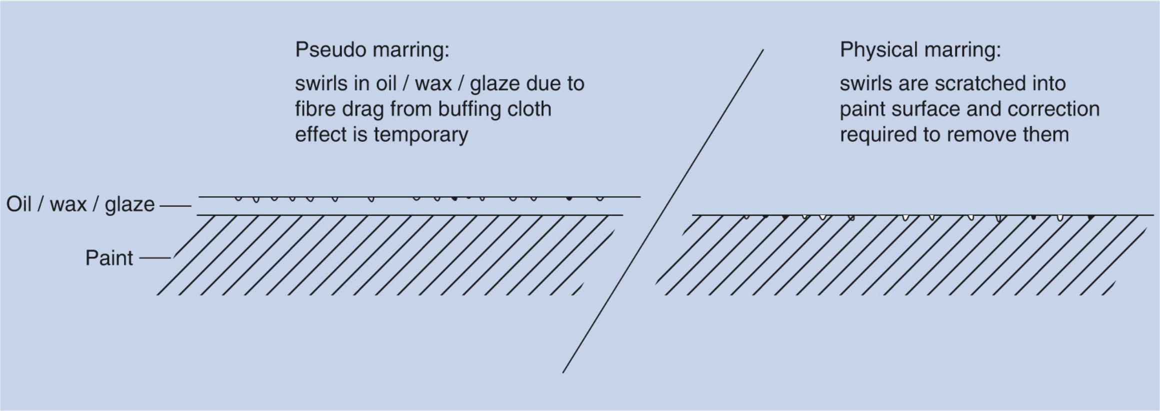
Pilling

If a strong solvent is applied to a wax or sealant that has not fully cured, the coating may become ‘rolled’ into small balls, rolls or ‘pills’. These wormlike strands are rolls of ‘pure’ protection product that have been stripped from the paint surface. If possible, remove them with a soft cloth and then allow the protection product to cure properly so that it can be buffed. If the product is still ‘pilling’, there will be no other option than to remove it entirely and reapply it correctly, avoiding any solvent interference afterwards. Strong tar removers or solvent-based spray sealants applied over a ‘fresh’ carnauba wax layer will typically lead to a high risk of pilling. If the carnauba wax has been applied over an oily base (due to an underlying glaze or polish) and cannot adhere to the paint, then pilling will be even more likely.

Marring

Buffing a wax or sealant residue, especially if it is stubborn to remove, could result in marring from the buffing cloth if it is harsh in texture and the paint is relatively soft. Using wax applicators and buffing cloths saturated in old, dry residue can also cause marring. Always use a soft, clean cloth for buffing – but note that softer materials with longer, plusher pile may remove residue more slowly than an 'aggressive' fabric.

Pseudo-marring (oil hologramming)


Pseudo marring:
swirls in oil / wax / glaze due to
fibre drag from buffing cloth
effect is temporary
Physical marring:
swirls are scratched into
paint surface and correction
required to remove them
Oil / wax / glaze
Paint

Pseudo marring versus physical marring.

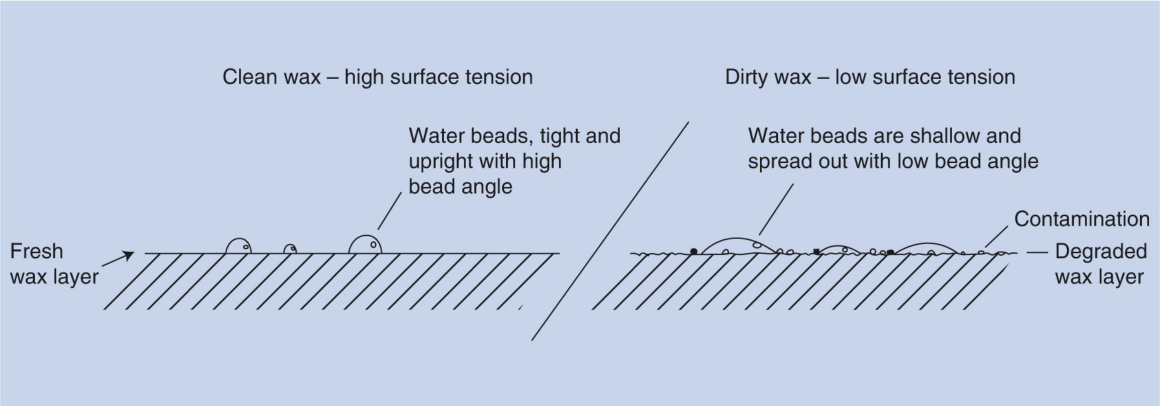
Pseudo-marring can look like smearing (*see* above) but deserves its own section. This occurs when a microfibre buffing cloth (typically made from a soft plush or super-plush fabric) fails to remove the protection product residue fully. Instead, the fibres drag the oily residue in microscopic lines, like the grooves of a vinyl record. From a distance, this looks like a smear or hologram. Close up, it looks as if the paint has been scratched (marred) by the cloth. However, it is just a visual effect caused by unbuffed residue, and buffing with a short or non-pile cloth (such as microsuede) will solve the issue entirely.

Water marks

Most water marks occurring after the application of a protection product will be of a surface type only, and not embedded into the product or paint surface. Removal with a soft cloth and detailing spray should prove quick and effective. However, there are a couple of instances when water marks may be far more stubborn to remove: the first of these is when a nano-product has suffered from hard-water water-mark etching. Many nanoceramics are acid-based and susceptible to caustic (alkali) erosion, especially during primary and secondary curing. Calcium carbonate is alkaline, and therefore hard-water droplets evaporating on to a nano coating can cause etched marks rather than just surface deposits. Rainwater, of course, contains no calcium carbonate: it is just tap water in hardwater areas that needs to be removed immediately from the surface (if hard-water spots are allowed to evaporate, the alkalinity concentrates as the water disappears, increasing the risk of etching). If the caustic water marks are allowed to etch the coating, the coating could subsequently cure with the watermark damage present. This creates semi-permanent water-mark etching, and machine polishing or wet sanding of the nano-coating will be the only solution.

The second is when a strong solvent product has been used on a cellulose finish immediately prior to hard-water contamination. In this case, the strong solvent softens the cellulose paint enough for its pores to open, allowing contamination (such as calcium carbonate deposits from hard-water spots) to become trapped when the pores close after outgassing. Whilst application of an acid or strong solvent may allow removal of the deposits, it is sometimes necessary to wet-sand the paint surface to remove them.

Premature beading loss


Clean wax – high surface tension
Dirty wax – low surface tension
Water beads, tight and upright with high bead angle
Water beads are shallow and spread out with low bead angle
Fresh wax layer
Contamination
Degraded wax layer

Water beading on clean/dirty wax.

'Beading' refers to how tight and 'upright' water droplets are when standing on a coated paint surface. Waxed surfaces may show very good beading initially, but this tends to drop off after a couple of weeks. Whilst it could technically indicate coating failure, it is far more likely to be due to, firstly, evaporation of hydrophobic oils originally captured within the honeycomb-like structure of a natural wax coating; secondly, surface dirt or contamination inhibiting surface tension; or thirdly, to the uppermost part of the wax layer exhibiting early stage UV degradation.

To check whether the beading loss is caused by surface contamination, wash the surface with a pH-neutral maintenance shampoo, then rinse and dry. The beading may return if it was previously inhibited by dirt. If the beading is caused by oil loss, embedded contamination or UV degradation, wax protection will still be present, despite the fact that beading is poorer than at first application.

In summary, beading is easy to misinterpret as a type of water behaviour, and should not be used to interpret longevity or durability of coatings without due consideration to other factors that affect beading.

REMOVING WAXES AND SEALANTS

It seems peculiar to analyse the application of different waxes and sealants, only to devote a section of this book to their removal. Why remove protection when it is so obviously beneficial? The answer is that protection products are, by nature, relatively ‘deep’ and durable coatings, and can therefore affect the finish of a car quite substantially, especially if misapplied. Should the finish be unsuitable or inconsistent, it may be best to remove the product and reapply it, or swap it for another one. Protection products can also degrade under the duress of sunlight, and become contaminated, whether acting as sacrificial protection or not – even repellent coatings break down and catch particles of dirt. So whether unhappy with the finish of a fresh coating, or decontaminating a panel before a respray, or simply removing the contaminated remnants of a previous protective layer, there are many good reasons why detailers should occasionally have to ‘de-wax’ or ‘unseal’.

Firstly, consider whether you need to remove the coating totally (say, for a respray) or whether you just need to get it substantially clean (perhaps for the application of a new wax layer). Total removal of a coating will generally take more effort and more time, and may even come with a greater risk of accidentally marring the paint underneath. This leads on to the next point, which is to pay attention to the underlying paint surface. Sensitive finishes should not be subjected to aggressive coating-removal techniques: cellulose paints, for example, could be damaged by harsh solvents, and soft paints may be marred by abrasive clays or polishes. Only attempt removal of a wax or sealant if the underlying paint finish won’t be compromised by doing so.

Next you should identify the type of coating to be removed. Natural waxes may be successfully removed with a strong detergent or solvent, whereas nano-ceramic sealants may need to be machine polished or wet sanded off (because they tend to resist solvents easily).

Then undertake removal, which is really an everincreasing system of decontamination, as described earlier in this book. Start by washing the panel with a strong detergent (a strong shampoo or washingup liquid solution), then check the water behaviour afterwards in terms of beading and sheeting. Repeat the application and see if the beading flattens or the sheeting slows, as this will indicate whether the detergent is having an effect.

Should detergent prove ineffective, consider trying the following types of decontamination product/process, depending on the coating to be removed and the sensitivity of the underlying finish.

HOMEBREWING: JUST FOR FUN, OR GENUINELY FOR FINISH?

Homebrews can be highly complex or achingly simple: this DIY kit makes the process extremely easy and allows for a good quality car wax to be created at home.

Creating simple wax blends at home using basic ingredients has become popular in recent years. Why? Well, detailers continue to hunt for the ‘holy grail’ of the ultimate wax; numerous boutique wax manufacturers are producing small batches of high performing products, with inspirational results; and also, there are numerous recipes, kits and social media groups/forums now available to help the amateur homebrewer.

Fundamentally, there is no strict ‘need’ to homebrew. Even the cheapest car waxes can outperform quite complex homebrews, and the time, effort and cost of homebrewing will rarely compare favourably with the ease of purchasing a ready-made, fully tested production wax. However, homebrewing is *fun*. The satisfaction of creating your own wax is akin to the enjoyment of cooking your own dinner rather than microwaving a ready meal, or making a homebrew beer rather than picking a can or bottle off the supermarket shelf.

In terms of a basic overview, homebrew waxes contain the following: natural or synthetic wax or waxes, some form of solvent or ‘carrier’ to dissolve the wax and make it spreadable, and usually natural or synthetic oils to assist application as well as increasing gloss and other desirable characteristics; sometimes the oils can act as the carrier, increasing the simplicity of the recipe. Colouring and fragrances may also be added, but these are of lesser importance.

If you would like to make a basic homebrew wax yourself, source some basic equipment and ingredients online, and follow the instructions below.

You will need the following:

- A double boiler or ‘bain marie’ (cookware shops sell these); alternatively you can use a glass jar placed in a saucepan full of water to act as your melting pot
- Some scales: make sure they are accurate from 1 to 50g as you will use only small quantities of ingredients
- Carnauba wax, beeswax granules and coconut oil (for the very simple recipe below); there is a vast range of potential ingredients available, and a dedicated drying oil or solvent will invariably improve application over the use of the ‘multi-tasking’ coconut oil, just as synthetic ingredients (such as silicone oils) may fortify the performance offered by the natural waxes

Four-Step Method

1. Measure out 20g carnauba flakes, 5g beeswax and 50ml coconut oil.
2. Take appropriate safety precautions, such as donning safety glasses – hot wax and boiling water may cause burns.
3. Melt the carnauba flakes and beeswax granules in the bain marie, or in a small glass jar sat in an inch or two of water in a saucepan. The beeswax will melt far more quickly than the carnauba, which turns into an amber liquid. When completely melted, stir in the coconut oil, and reheat whilst stirring until the mixture is completely liquid again.
4. Turn off the heat and add cold water to the pan, up to the level of the wax in the glass jar, being careful not to contaminate the wax mixture itself. Leave overnight to cool: this should ensure that the resultant wax has a good consistency. The less desirable alternative is to remove the glass jar from the saucepan completely (being careful not to burn yourself) and then allow the wax mixture to cool gradually and naturally overnight on a heat-proof surface (do not ‘force cool’ it by putting it in the refrigerator).

You will be left with a useable and competent hard car wax, although it will be far behind the best products on the market in terms of application, refinement and performance. But it may impress for such a simple hand-made creation, created from just three ingredients. To apply, just use a soft foam applicator to spread the wax on to paintwork. Allow a good half an hour for it to haze/cure (coconut oil is a slow-drying oil) and then buff the residue to a high shine with a soft cloth. Keep the wax in an air-tight container to preserve it (workability will diminish with solvent loss, and it may become completely unworkable if it dries out too much).

ALL-PURPOSE CLEANER, TRAFFIC FILM REMOVER

To increase aggression beyond a detergent, reach for an APC, and then a TFR, being careful not to damage delicate paint finishes or trim: APCs and TFRs are likely to be caustic, and these products will attack many types of waxes and sealants, including nano-ceramic products. Vary the concentrations if required, then check the water behaviour of the panel to see if it has changed. Rinse thoroughly with water afterwards to avoid any residues damaging sensitive trim.

ACID WHEEL CLEANER

Acidic wheel cleaners are very effective at removing organic protection products (for instance, carnauba waxes), and if used after APCs and TFRs will have the added benefit of neutralizing caustic products applied previously. This means that a complete approach to decontamination is being taken, and products that resist alkalis will be met by acids, and vice versa. If you don’t have an acidic wheel cleaner, DIY brickcleaning solutions may prove effective – although exercise caution with sensitive finishes, especially metal trim. Once again, rinse thoroughly and assess the result of the application(s) afterwards.

SOLVENTS

Solvents range from mild to strong, but because waxes and sealants are solvent based they are likely to have some kind of an effect. Mild solvents include 50/50 IPA solutions and certain glass-cleaning sprays; strong solvents will include panelwipe and intensive tar/glue removers, such as Autosmart Tardis. Solvents should be used with care on older, cellulose finishes, but will be effective at removing most products. Only nano-ceramic sealants are likely to remain, and these can be removed subsequently through abrasion. Check the water behaviour of the panel after solvent applications of increasing strength and frequency. Then, finally, wash the panel fully to remove any traces of solvent that may remain (these could melt a clay bar used in a later decontamination stage).

CLAY BARS (FINE TO COARSE GRADES)

It is likely that only nano-ceramic sealants will remain after chemical decontamination, so abrasion is the next course of action, carried out initially by a clay bar. Start with a mild clay bar and lubricant, because of the potential for marring the underlying finish, followed by a coarser grade of clay if required. (Note that if any damage to the paint finish occurs, you will need to re-polish the panel afterwards.) Nanoceramic sealants may resist fine-grade clays, but coarse clay application is usually effective. Wash off all remnants of clay lube, then check the water behaviour of the panel (soap-based clay lubes will kill beading and potentially lead to a false conclusion).

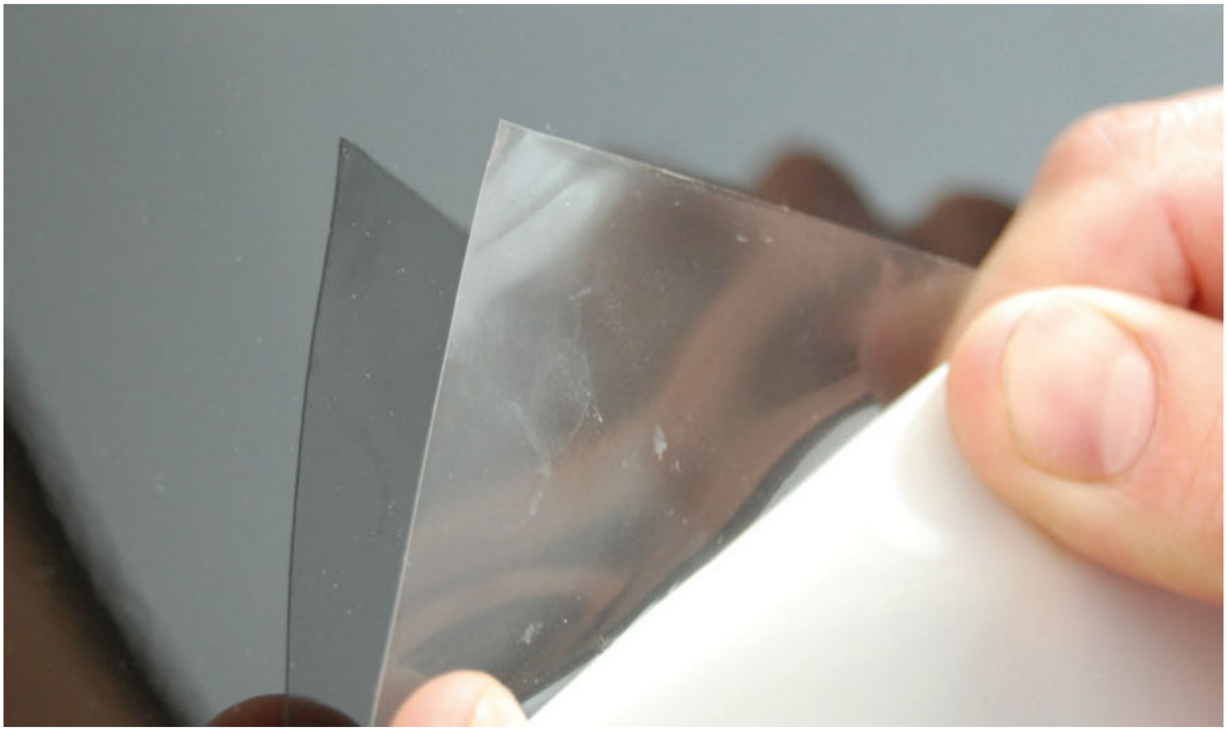
MACHINE POLISHING, WET SANDING

In very rare circumstances claying may prove inadequate, and machine polishing or wet sanding will be the only options left. Remaining wax or sealant residues could cause stickiness and inconsistent results, so this technique should be avoided until chemical decontamination has taken place and proved ineffective. Follow the guides to machine polishing in this book (starting with light cutting techniques), and then move on to a wet-sanding process if machine polishing isn’t working.

To conclude, the only instance when wax or sealant may remain after the completion of the decontamination processes above, is when the underlying paint is porous (due to UV degradation/oxidation). This means that the wax or sealant has sunk into the paint below a level that can be polished or sanded, and beyond the touch of chemical decontamination.

Remember, however, that waxes and sealants are rarely a permanent alteration to a car’s finish, and that if you decide that removal is too risky, the wax or sealant is going to degrade anyway and become less of an issue as the weeks and months pass. You may even find that you can reapply the same product, or use another product, over the ‘problem’ coating and achieve a fine finish without the need to remove it. As with other facets of detailing, there are no definitive rules, just a plethora of options.

SEMI-PERMANENT PROTECTION



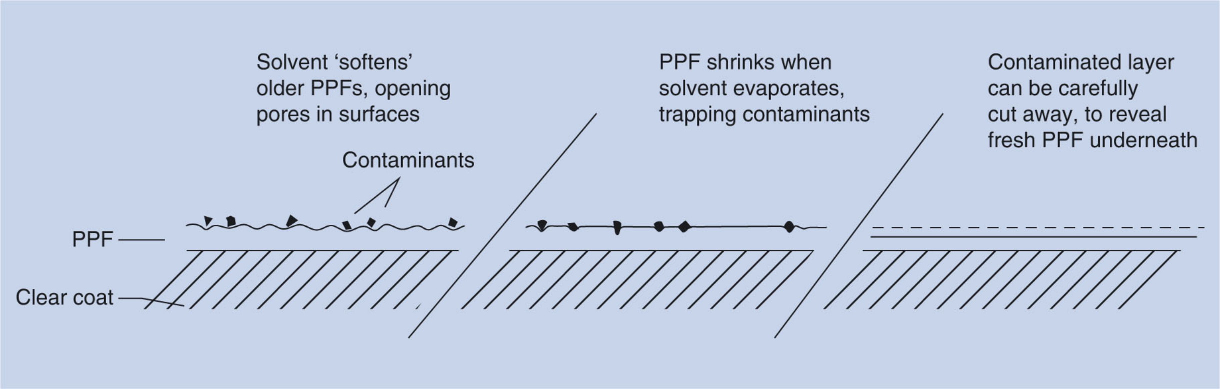
Applied correctly, paint protection film may be almost invisible to the casual observer, yet its protection may far exceed that of traditional waxes and sealants.

Detailing is concerned with ‘temporary’ coatings – even the latest nano-sealants may only last a couple of years on cars driven daily, before they wear off. However, paintwork can be protected in other ways, most notably by the semi-permanent application of an adhesive plastic film. This can take the form of paint protection film (clear ‘stone-chip’ film), or vinyl stickers/wraps: in both cases the paint is protected by a shield of plastic that presents a relatively thick and compressible cushion to aggressive contaminants. This may inhibit the optical clarity of the finish, but it is a very effective way of guarding against stone chips and scratches. The problem is, of course, that the plastic protective film often becomes scratched, perhaps even more easily than the paint underneath, and this will subdue the finish. To prevent this from happening, you can protect the film (an irony considering that it is offering protection itself), or choose a ‘self-healing’ film, or even ‘correct’ the plastic film by polishing out any mild defects.

INSTALLING PAINT PROTECTION FILM (PPF)/VINYL

It is advisable to get paint protection film professionally applied, because it may be unsightly if bubbles or contaminants are captured in the adhesive, under the film. Removal should only be a last resort, as paint could be damaged during the removal process, so it is not a product to install recklessly. Note that some films require cutting ‘on the paint’, and scalpel damage to the paint could result; the best will tend to be precut. Always consider the risks when installing a film, and ensure you see the film as a semi-permanent, rather than temporary, paint protection solution.

PROTECTING PAINT PROTECTION FILM/VINYL


Solvent ‘softens’ older PPFs, opening pores in surfaces
Contaminants
PPF
Clear coat
PPF shrinks when solvent evaporates, trapping contaminants
Contaminated layer can be carefully cut away, to reveal fresh PPF underneath

Dirt ingress into paint protection film and its subsequent correction.

Any wax or sealant designed to protect a soft paint finish may be suitable, should additional protection for the film be required. Care must be taken not to choose a protection product that uses a strong solvent as a carrier. Strong solvents may open the pores in the film, allowing dirt to ingress and therefore inhibiting the finish. The ‘yellowing’ of older PPFs is often down to the use of products containing strong solvents; the softened film captures dirt over time, leading to a yellowing or browning effect.

RECTIFYING PAINT PROTECTION FILM/VINYL

Like soft paint, PPF can usually be carefully corrected until a swirl-free finish is achieved. Yellowing may even be improved. Care must be taken to cut the film gently, at low speeds and low temperatures. An orbital machine and fine-cut compound may guard against the inadvertent introduction of machine marring. Note that some films may be corrected by the action of strong solvents, or may even ‘self-heal’ with hot water, so it pays to identify the film type and then to use the advised correction method.

Offering even more protection than vinyl film (especially against stone chips at the front of the car) is the ‘bonnet bra’: an even thicker, more cushioned – and more noticeable – overcoat for external paintwork. Unlike vinyl films, however, these are non-adhesive ‘loose-fit’ accessories that merely ‘sit’ on the paintwork, anchored via elastic or tensioned straps. This makes them easier to remove than vinyl film (say, when the car is exhibited at a show), but it does mean that dirt particles can migrate underneath the bra and abrade the paint if movement/vibration occurs (so ensure that they are tightly fitted and cleaned inside regularly). Ultimately this means that bonnet bras present a risk to paintwork, which may offset the benefit of protecting the paint from stone damage when the car is out on the road. Whether one danger outweighs the other is for the car owner to determine.

CAR COVERS

Bonnet bras are unsightly and present a small risk to the paintwork beneath, but the protection they offer against stone chips is undeniable.

Of course, you can always protect the whole car with a cover, although these can only be used when the vehicle is static and not in use (unlike paint protection film and bonnet bras). Covers come in interior and exterior types:

Interior car covers: These are light covers that protect the car from dirt and dust, but are not water repellent. They are soft and flexible, perfect for garage use, and are rarely a danger to paintwork because they are breathable and generally only used in gentle ambient conditions (when there is no wind or rain).

Car covers offer good protection when the car is stationary, but harsh materials, dirt, dubious fixing methods and aggressive ambient conditions may all pose a risk to the paintwork beneath.

Exterior car covers: These are heavier duty waterproof covers that may or may not be 'fitted' to the shape of the car. The risks to paintwork are much greater because the fabrics used tend to be harsher, there is a reliance on straps or ties to harness the cover to the vehicle, wind may move the cover aggressively when it is in position, mould may propagate if the fabric is not breathable, plus there is a higher chance of contamination being present under the cover (due to being fitted to a vehicle that has inadvertently been left dirty, or because contamination has naturally made its way under the cover).

Needless to say, the car must be clean before a cover is fitted so as to avoid any paint damage, and exterior covers are best avoided unless there is an extremely good reason to use one (perhaps because of heavy airborne contamination). With exterior covers, ensure any straps or ties are as tight as possible to avoid excessive movement in high winds, and if they make contact with delicate or painted surfaces on the car, use a soft microfibre cloth to cushion the strap. Try not to drag the car cover over the paint when fitting or removing it – an assistant will be invaluable here, and careful folding or rolling is a better technique than dragging or sliding. Only use exterior car covers made from breathable fabrics to avoid moisture being trapped between the cover and the paint, whether from standing water at the time of fitment or due to condensation on hot days. Trapped water can encourage rust, propagate mould, host contaminants, and may even lead to the cover ‘sticking’ to the paint in extreme circumstances, perhaps causing irreversible paint damage.

CAR STORAGE: THE IDEAL CONDITIONS

In an ideal world, cars would be stored in a controlled environment when not in use. Filtered, dehumidified air would circulate over their bodywork, ensuring that moisture and dirt particles are both kept at bay. The easiest way of achieving such conditions is by means of a ‘car bubble’-style tent: a small plastic pod that lives in a garage. These have air pumps to recirculate filtered air, keeping the environment fresh (and low in humidity and contaminants). Temperatures would always be moderate.

For longer-term storage the car should be moved a couple of times a month to ensure that rubber seals and moving parts are lubricated, and to prevent components sticking. Fuel should be renewed every six months to prevent ‘varnishing’ (the degradation of the fuel in the tank). Consider axle stands if the car is left standing for more than a year, to prevent the tyres ovalling. Manual clutches on cars left for six months or longer without movement should be wedged ‘open’ by depressing the pedal with a weight or lever to prevent the clutch plates binding. The handbrake should be left ‘off’, again to prevent binding: in this situation always leave the car in gear and ‘chock’ the wheels to prevent accidental movement.

Detailing-wise, non-granular deposits (such as dust) can be removed from bodywork with the regular use of a statically charged wool duster, but these must never be used in humid or damp conditions, or if the panel is wet or oily. Detailing spray and soft microfibre cloths can be used to add lustre and remove fingerprints and so on. Dirt and granular deposits should be washed off in the usual way.

The trick is to maintain the finish and give it regular attention: if the car is left for a year unattended, it will be covered in all sorts of debris that could have become embedded or bonded to the paintwork, and this will be far more stubborn to remove, with possible adverse consequences for the car's finish.

CHAPTER FOUR

OTHER EXTERIOR SURFACES

THE KNOWLEDGE

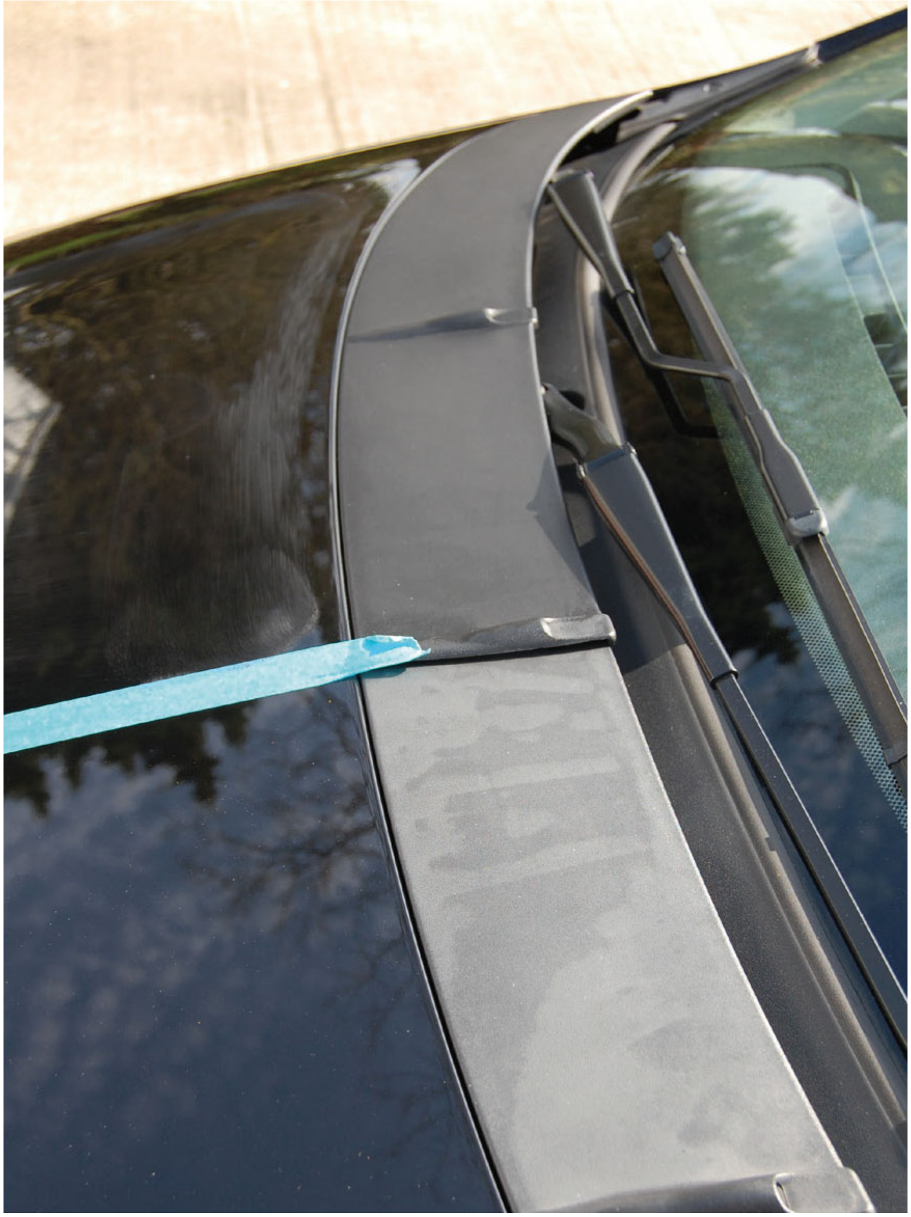
Cars are not smooth-painted pebbles, devoid of detail. They sport grilles, bumper strips, windows, window trim, wipers, ventilation intakes and many other features, all made from a variety of materials. If these are not cleaned and treated, they could detract from the overall appearance of the vehicle. It is therefore important to deal with them in a similar way to the exterior paintwork. Detailing is, after all, about the details.

EXTERIOR SURFACE TYPES

Paint, despite its varieties and potential afflictions, can be considered a ‘known’ factor compared to the wider selection of exterior surfaces also found on a vehicle. These include plastic, metal, rubber, glass and fabric materials, in smooth and irregular textures. Cleaning and protecting these surfaces may differ drastically; for example, glass is relatively reactive as a material, bonding readily with covalent glass sealants, in contrast to paints and plastics, which are inert. Metal and glass may be far more scratch-resistant than soft plastic trim. Black plastic exterior trim may crack or fade, and rubber seals can perish.

In summary, these areas cannot be treated simply, with one approach: every surface needs individual attention in order to prepare and treat it to the highest standards.

SMOOTH PLASTIC TRIM (UNPAINTED)



Smooth plastic trim is used extensively on vehicle exteriors, and dark finishes will be prone to fading. This trim piece has been half dressed to show the effects of a suitable product.

Black or dark grey smooth plastic trim is used extensively for bumpers, rubbing strips, the front scuttle panel and other trim. Being unpainted, it may resist minor impacts and damage without becoming disfigured, but medium to hard contact will lead to scuffing, scratching or even cracking. Fading is also an ever-present danger. The trim may be a matt or satin finish depending on the type of plastic used.

Some gloss plastic trim panels may also be found on door frames/pillars; these gloss panels scratch more easily than matt/satin plastics and are usually best treated as soft gloss paintwork in detailing terms.

TEXTURED PLASTIC TRIM (UNPAINTED)

Textured trim is used for heavy-duty trim applications, where a smooth surface and the improved appearance that results is less critical. Van and 4 × 4 bumpers, wing-mirror casings and door kick plates are likely to be made from this robust and indelicate material. The texture means that any scuffs or scratches are less obvious in appearance (but may still occur).

PLASTIC AND METAL TRIM (PAINTED)

Painted trim (black or body-coloured) can be treated in much the same way as standard paintwork. Painting plastic or metal surfaces helps reduce the incidence of fade, but it only suits less flexible trim and is easily disfigured by surface scratching. Black window surrounds are a common example of this trim type.

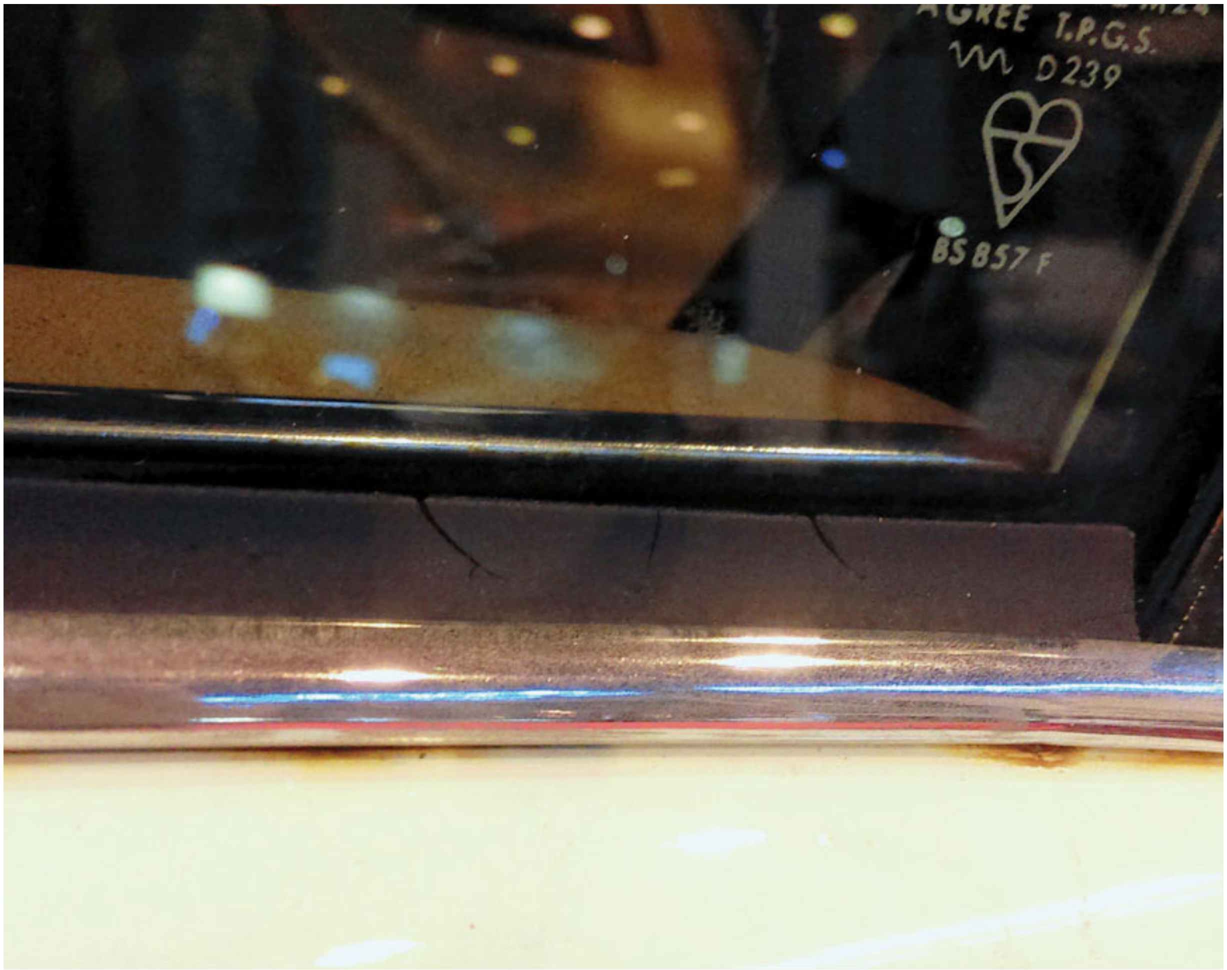
METAL AND METAL-PLATED TRIM

Chrome trim used to be extremely popular and still finds its way on to modern cars in many areas, most notably grilles, bumper strips and window surrounds. Metal is more scratch-resistant than plastic and paint, making it a durable choice – although note that chrome plating can be thin or poor quality and therefore removed more easily than you would think. Care must also be taken with brushed metal finishes, because these can easily be accidentally ‘over-polished’. Finally, be wary of strong cleaning products: the reactive nature of metal means that aggressive acids and alkalis can etch the finish, especially if used neat or left to dwell.

PLASTIC TRIM (METAL EFFECT)

A lot of metallic trim seen on modern vehicles is actually a metal-plated or metal-effect painted plastic. This is obviously considerably cheaper for manufacturers compared to ‘real’ solid metal trim. It is important to distinguish between a chrome or metal paint effect and a thin veneer of ‘real’ metal. Metal paints/plastics are normally resistant to acids and other strong chemicals, but real metal veneers may tarnish and discolour. However, real metal veneers generally have higher scratch resistance, whereas any painted or plastic surface is going to be softer and more scratch prone.

RUBBER TRIM



Old rubber trim will be inflexible and unsightly; UV light and a lack of maintenance will accelerate its deterioration.

Rubber is supremely flexible, making it a great sealing material for windows, door seals, wipers and gaskets. This flexibility makes it relatively robust when new. Whilst it can still scuff and tear, minor abrasion is often repelled by the sheer elasticity of the surface. The issues with rubber trim tend to arise when the rubber becomes perished; old, UV-damaged rubber can be brittle, hard, cracked and discoloured. Extreme heat and harsh solvents are also dangers, and both can melt soft rubber components.

GLASS (INCLUDING WINDSCREEN AND MIRRORS)

Plastic windows scratch relatively easily, but may benefit from being machine polished (carefully) at low speeds/temperatures.

Glass is a really interesting material in detailing terms, because it can be highly reactive at a microscopic level, as well as being commendably scratch resistant (it can be scratched, of course – you only need look at the scoring of dirt grains across a wiper arc – but generally it will resist most products that would damage paint or plastic).

The reactivity is down to ‘covalency’ at an atomic level: this allows certain sealants to bond chemically to the glass, thus affording a higher longevity and durability than would otherwise be possible. This is down to the high silica content of glass, silica being a semi-conductor – that is, a mineral, rather than a metal – able to conduct electricity. Paint, a mere plastic, is far less reactive, and sealants can only bond with the coating through simple adhesion.

HARD CLEAR PLASTIC SURFACES

These surfaces include headlight lenses, light clusters and so on. Hard clear plastic will tend to be either acrylic or polycarbonate, and both are types of thermoplastic (acrylic brand names include Perspex and Plexiglas, while polycarbonate brand names include Lexan and Makrolon). These are similar materials, but polycarbonate will generally be a little softer and more flexible, and therefore less likely to shatter or break than acrylic, but will scratch more easily. The glossiest finish will also be found with acrylic materials. Both plastics can be polished to remove light scratches, but care must be taken: they will mar if abrasives are used incorrectly – and being thermoplastics, too much heat during the polishing stage could cause irreversible damage (in the form of heat 'clouding').

SOFT CLEAR PLASTIC SURFACES

These surfaces include PVC and Vybak plastic windows. Softer, clear plastics are extremely sensitive to scratching and UV damage, both of which cause cloudiness/reduced opacity, and strong solvents or even cold weather may damage them. They are usually only used in older-type convertible soft-top windows. This is one of the most delicate exterior material types that a detailer can come across.

SPECIALIST EXTERIOR FINISHES

These finishes include materials such as wood, stainless steel and anodized aluminium. Car manufacturers are increasingly attempting to impress customers and out-manoeuvre their competitors by using exciting materials and finishes for their vehicles, inside and out. This includes the use of wood (for example for the 'deck' of the Rolls Royce Phantom convertible) and metal veneers (as for the stainless-steel bonnet of the aforementioned Rolls Royce). The wide variety of materials means that specific identification and instruction is impossible via these pages, but as long as each material is treated with due care and diligence, it should be possible to achieve effective, and safe, results.

FABRIC (INCLUDING MOHAIR) ROOFS/HOODS

Convertible ‘soft-top’ cars will often have a coloured fabric roof, commonly made from canvas or ‘mohair’ (the mohair used for convertible roofs will most likely be a synthetic mohair, rather than the traditional Angora goat-hair fabric it literally refers to). This dyed fabric will not only have to resist the rain, it also needs to resist the sun (UV fading) and the constant demands of hood operation (stretching, folding and being subject to pervasive moisture, or even mould). Note that fabric roofs may only have fabric on the outermost layer; they could be made from four, five, six (or more) layers of material, but it is only the outer layer that we will be concerned with.

VINYL ROOFS/HOODS

Vinyl is a far cheaper and potentially higher-performing hood material than fabric. It is used for lower-end convertibles and may not have the same appealing finish as the woven alternatives, but it could be more waterproof and should need less maintenance. Sadly it is more susceptible to UV degradation, and can crack as well as fade. Vinyl roofs are often likely to be single layer due to their inherent water resistance and economical nature.

CONTAMINATION TYPES

Exterior contaminants will generally be the same as those found on paintwork (*see* the relevant chapter), so there is little to be gained by covering them again. However, some forms of contamination are more specific to exterior trim and are therefore detailed below.

ALGAE AND MOSS ON WINDOW RUBBERS

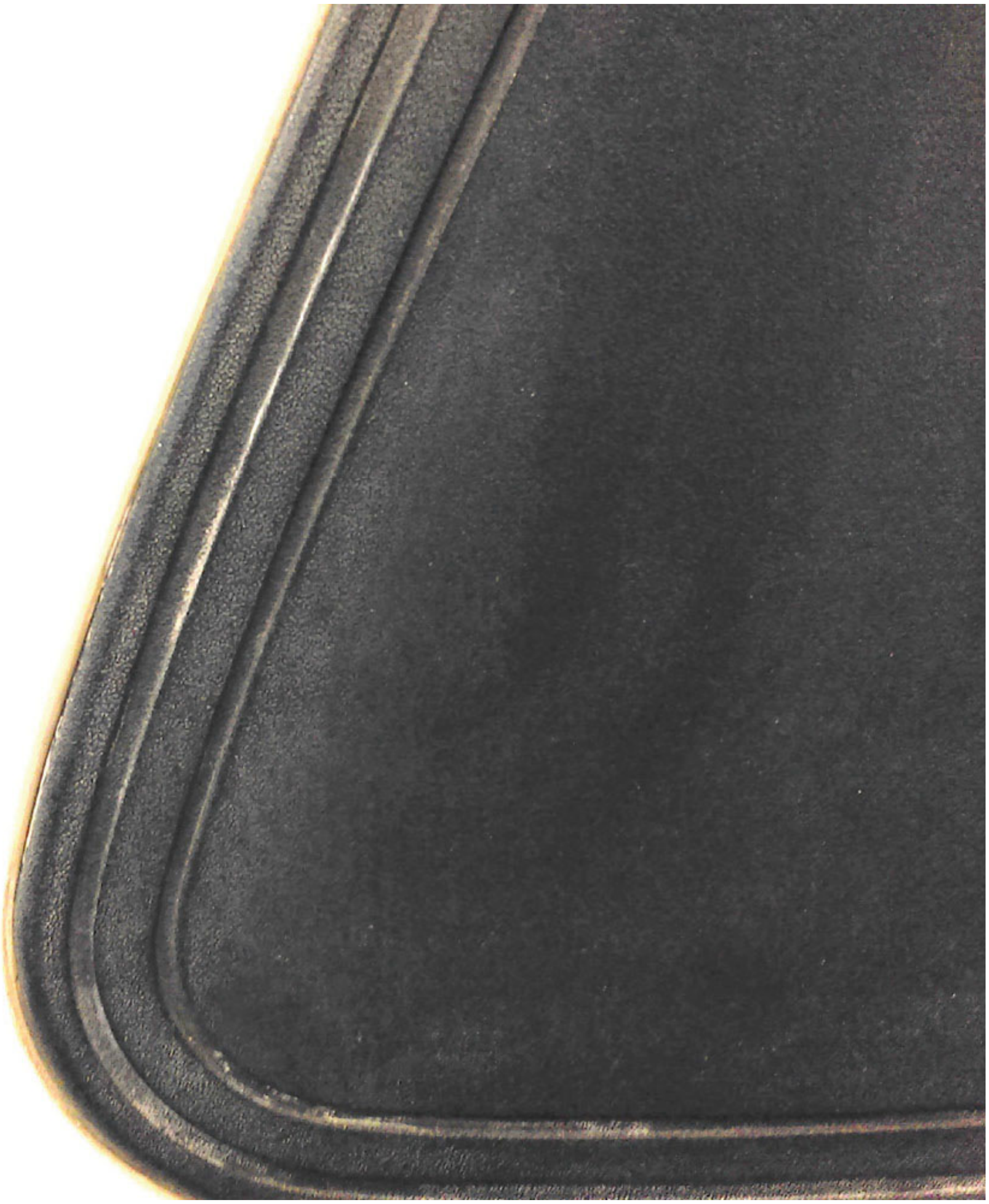
Window rubbers may harbour algae and even moss if the windows are infrequently cleaned and conditions are favourable (when water and sunlight are both present).

Dirt that collects in window rubbers receives an ample supply of water and sunlight, making it a perfect environment for the propagation of algae, moss and other plant matter (perished trim is more prone to hosting this type of contamination due to the higher number of anchor points provided by the rougher surface texture). The same can be said for felt trim, typically used to seal sunroofs. In all cases, plant matter should be removed as soon as possible and not allowed to take hold or multiply. Grit contained in the soil-like debris can score glass or window-tinting film if dragged against the window when it is opened and closed.

MOULD AND MILDEW ON CONVERTIBLE ROOFS

The folding nature of a convertible roof means that firstly, moisture can be trapped when the hood is opened; and secondly, creases (folds) in the roof naturally collect more moisture and contamination than the main panels. Moulds and mildew need moisture to grow, and the rough texture of canvas or patterned vinyl makes for an ideal breeding ground.

POWDERED RESIDUE IN TEXTURED TRIM



Abrasive products are likely to leave powdery residues on textured trim if misapplied to these surfaces.

The application of products with opaque residues – principally polishes, which contain a chalky, abrasive media – will often leave powdery marks or stains on textured, cracked or uneven surfaces. This is simply because the residue is captured by the grain or rough surface texture and cannot be easily buffed or removed. Even residues that may seem initially transparent could gradually 'dry out' as solvents evaporate, to reveal unsightly deposits many days or weeks later.

WATER MARKS ON GLASS

Water marks are an evergreen thorn in the detailer's side, whether those that can be lifted easily from the paint surface (yet are annoyingly abrasive), or those that are laden with acidic or caustic contaminants and can therefore etch the paint surface if left unattended for a long period of time. At least glass is a harder material than paint and etching is therefore rarely seen. Indeed, it is rare for abrasive particles in water marks to scratch glass during their removal. This does not mean that they are necessarily easy to remove, however: limescale water marks can be a particularly stubborn form of contamination, and may leave light staining even after moderate glass cleaning.

DEFECT/IMPERFECTION TYPES

Scratching and staining isn't isolated to paint, and some exterior surfaces are even softer or more delicate in material terms. What's more, these surfaces can sometimes be even trickier to repair. Knowing the defect or imperfection, and how it can arise, gives the detailer an insight into its potential correction.

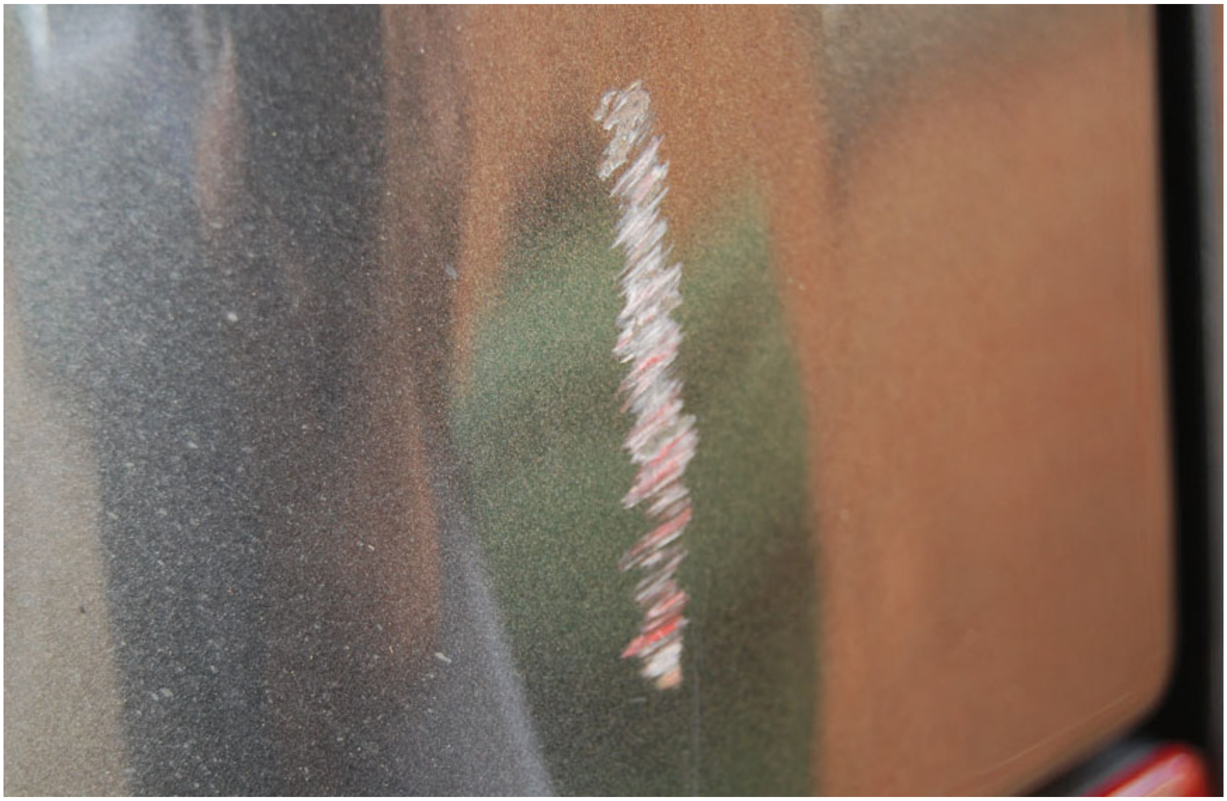
SWIRL MARKS/SCRATCHES/MARRING/SCUFFING ON PAINTED TRIM AND PLASTIC SURFACES

Paint and plastic are relatively soft materials compared to the contaminants that may come into contact with them. Even mild pressure with a harsh or contaminated applicator or cloth could cause microscopic scratching (marring, scuffing or swirl marks) or deeper scratches (RIDS). These may be difficult to ‘correct’ or remove if the surface is unpainted, and matching the finish seamlessly may be impossible.

FADING OR STAINING ON PAINTED TRIM AND PLASTIC SURFACES

Sunlight and aggressive car-cleaning chemicals (such as TFRs and APCs) can stain or degrade dark trim materials. The damage to the finish will normally be difficult to rectify because the material will have been chemically broken down, and replacing or repainting the trim may be necessary. In some cases, however, stains may be superficial – perhaps caused by hard water or polish residues – and relatively simple to remove. The only way to identify whether the stain is removable or not will be by attacking it with various cleaning solutions and then gauging the results, as well as checking whether the contamination is etched (sunken) into the surface, or is sitting on top of it. Removable contamination is more likely to be lightly embedded into the top surface and identifiable as being slightly raised, whereas permanent damage may appear to be etched into, or at a level below, the regular paint/trim surface.

PAINT TRANSFER ON PAINTED TRIM AND PLASTIC SURFACES



Paint transfer typically takes place when two vehicles touch: pressure/friction rubs paint off the original surface, like a crayon.

If a painted surface scuffs against a panel or piece of trim, there is a high chance of paint transfer. Luckily the paint will rarely bond as successfully as if it were painted on, and can usually be removed by a mild solvent or through machine polishing.

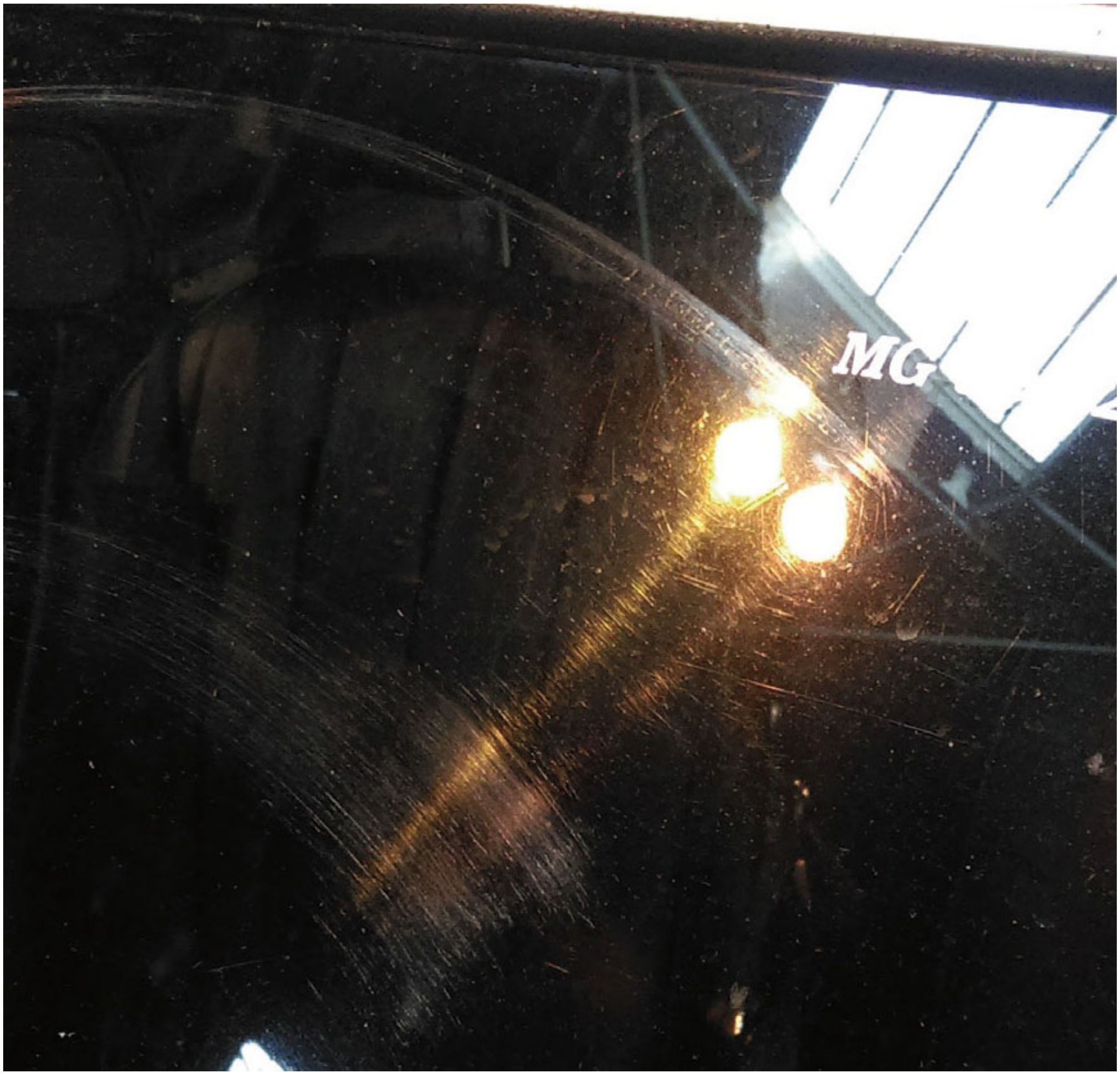
SWIRLS/SCRATCHES/MARRING ON METAL SURFACES

Whilst metal trim is not quite as prevalent as it used to be, the exterior of a car will still feature a number of items of metal (or metal-plated) trim. These can become scratched quite quickly if the metal is soft (for example, aluminium) or if abrasive contaminants or cleaning products are encountered. Metal scratches less readily than painted surfaces, of course, but this also means that scratches and marring can be more difficult to remove, requiring heavier cut metal polishes and more intensive polishing techniques.

STAINING/DISCOLORATION ON METAL SURFACES

Many metals are reactive, oxidizing in the air or becoming tarnished when attacked by acidic or caustic deposits. And even the less reactive metals, such as stainless steel, can become dirty or tarnished. Sometimes this discoloration is a residue or a mild surface effect and can be simply and easily removed, but unfortunately there are other times when pitting, etching or a deeper surface effect has occurred. These marks will be far more difficult to correct, and may even have to be classed as permanent damage.

SWIRLS/SCRATCHES/MARRING ON GLASS



Regular glass polishes cannot remove scratches in glass; specialist glass-cutting pads and abrasives will be required.

Glass is a far harder material than paint or plastic, and will be more scratch resistant as a result. However, when it does mark, it will be far harder to repair. You may notice tiny scratches under the arc of wiper blades on the windscreen, after they have repeatedly dragged small grains of ultra-hard dirt (typically a silica/sand deposit) across the glass surface. These scratches are rarely obvious at first glance, but they can be annoying because they tend to be in a line of sight or noticeable in direct sunlight.

Scratches in glass cannot be removed using standard detailing products – even regular strength glass polishes (that are formulated merely to clean the glass) will fail in the task. Specialist scratch removers are required, such as cerium oxide pastes. These are highly abrasive and must be used with extreme caution, as any splatter or sling that lands on paintwork is sure to cause some kind of damage when the product is wiped off. The heat involved in machine polishing with aggressive glass compounds could also distort glass, causing permanent damage. Tolerating glass scratches, or having them professionally polished out, may be preferable compared to attempting to remove them yourself.

SCUFFING/TEARS ON RUBBER TRIM

Rubber is flexible but it is also a soft material, and can therefore tear or become scuffed, and this kind of damage will be difficult or impossible to repair. However, the appearance of the scuff or scratch can often be improved. Rubber trim may also suffer from fading (UV sun damage), which could ultimately make it go brittle and crack, and its relatively rough surface texture means that it has a natural appeal to certain contaminants, such as algae. In extreme cases heavily degraded rubber trim may need to be replaced, although thorough cleaning, dressing and treatment of rubber surfaces will work well in the majority of instances.

SCUFFING/TEARS ON FABRIC AND VINYL

Fabric and vinyl can be very difficult to repair should they become cut or torn, though luckily they are relatively durable and tear-resistant materials by nature. Swirl marks are obviously less of an issue than staining, fading, stretching or ripping. Good maintenance may help enhance and preserve the finish, but any repairs may need to be professionally carried out if damage occurs; DIY options are relatively limited.

PRODUCTS AND EQUIPMENT

Products will either remove contaminants, enhance the finish, repair/restore damage, or undertake a combination of the above. The hardness, porosity, flexibility and texture of the material will dictate the nature of the product to be used, and extreme differences in product types may be found. There is therefore little point in trying to define the individual product types here. Just be mindful that a specialist product may be required for the task in hand, matched to the exterior surface type.

Regarding equipment, there will be a natural overlap with equipment used in other areas of detailing, and applicators and microfibres may be common to almost all types of exterior surface. However, there are some specialist items that are particularly of note, and as with products, these are best considered in relation to the surfaces they act upon.

SMOOTH PLASTICS AND PAINTED SURFACES

Sponge/foam applicators will be a logical choice when working with liquid dressings, and soft buffing cloths, probably made from microfibre, should be chosen for residue removal. Plastic may scratch as easily (or even more easily) than paint, so care is required.

TEXTURED PLASTICS

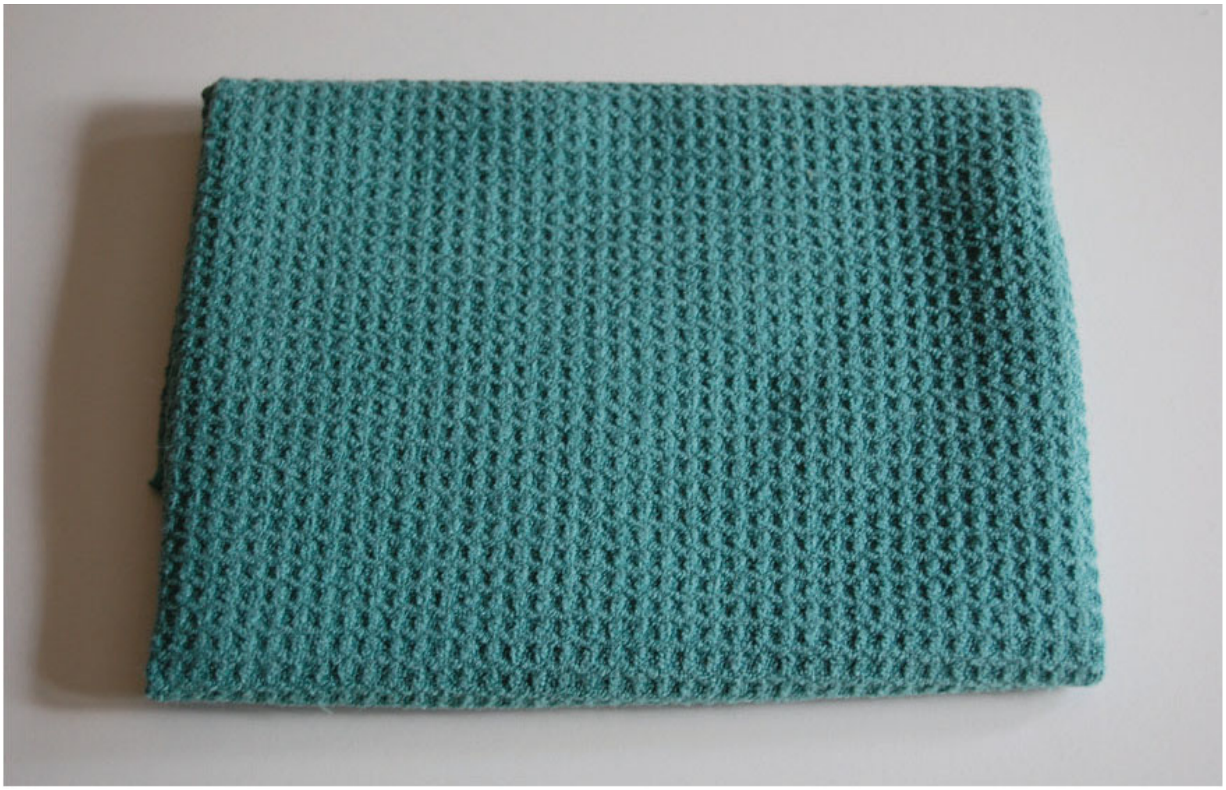
Applicators cause few issues, but it is important to use lint-free cloths for residue removal. Plush or super-plush microfibres are likely to be unsuitable. The rough surface of grainy or textured plastics will pull fibres from certain materials, and even woollen wash mitts during the initial wash stages. A short pile or microsuede microfibre will be more suitable; a scrubbing or nail brush may even work well for a more aggressive clean. If residue has collected around the edges of plastic trim, detailing swabs (small sticks with fibre or fabric heads) may be usefully employed. Note that standard cotton buds have a tendency to unravel during use and can also scratch delicate finishes, so professional-quality swabs should be considered despite the inevitable price premium.

CLEAR PLASTICS

Transparent plastics (as used for headlights or convertible roof windows) may be particularly soft, and the use of non-abrasive applicators and cloths is essential. Polishing clear plastics may be possible with dedicated kits, by using certain machine-polishing pads and compounds with paint correction techniques (*see* earlier chapter), and even by wet sanding in the case of harder headlight covers, but care must be taken, as not only do these plastics scratch easily, but too much heat can cause permanent damage to these relatively delicate materials. Once ‘blown’, the clear plastic will have suffered irreversible heat damage and will require replacement.

GLASS

Glass is a much harder material than paint or plastic, and more aggressive polishing cloths (such as waffleweave microfibres) can be used for the application or removal of glass products, without the risk of marring. Indeed, their absorbency and aggressiveness can help prevent smearing on glass and will ensure complete and effective removal of any surface residues.



Waffle-weave microfibre has excellent absorbency and plenty of 'bite' to remove contamination; it won't scratch glass, although it may mar soft paints.

Non-linting fabrics (for example, microsuede) are also less likely to smear on glass or leave fibres behind, but they may not remove stubborn residues as quickly as a waffle-weave microfibre cloth. Long-pile plush or superplush microfibres are not recommended: their inherent softness is not required, and the pile may drag oils or grease across the hard glass surface rather than removing it. Foam and microfibre applicators could be employed on glass, but (in most instances) the application of products by the buffing cloth itself will be satisfactory. Note that glass can be clayed successfully, so using a clay bar for deep cleansing and decontamination of windows and windscreens is perfectly acceptable (and even medium to coarse grades of clay should be safe to use on glass surfaces).

METAL

Cloths for cleaning and polishing metal tend to be sacrificial rather than ‘special’ (due to the heavy deposition of black residues), and of a coarse texture rather than soft, because this is much more effective at cutting and polishing hard metal surfaces. Fine metal ‘wool’, wet-and-dry sandpapers and specialist polishing ‘wheels’ (flaps of cloth or abrasive material attached to a central spindle and driven by an electric drill or bench grinder) are likely to be employed for heavier metal-polishing duties.

VINYL AND RUBBER

Foam applicators are perfect for covering vinyl and rubber surfaces with the relevant cleaning products, dressings and sealants. For ingrained dirt, a softbristled brush will probably prove effective. When buffing or removing coatings on these surfaces, take care to avoid the use of medium- or long-pile microfibre cloths, as these are likely to lint (shed fibres). Short-pile or lint-free cloths should be used.

FABRIC

Professional-grade sticky rollers remove dry contamination from fabrics with ease; cheaper sticky rollers can be used but may be less adhesive and also have a smaller length roll.

Short-bristled brushes work well for applying ‘wet’ treatments to fabric roofs. If dry lint needs to be removed, a specialist sticky roller should be used, as this will collect lint, fluff, hair and dirt particles on the gummed strip. ‘Wet’ and ‘dry’ vacuum cleaners may also prove useful on suitable fabrics, as will steamcleaning machines, but be careful with water ingress into multi-layered roofs via the stitching as the moisture may be difficult to remove subsequently from internal layers and could lead to the proliferation of mould. Finally, never retract or store a wet convertible roof, but always allow it to dry before storage: this helps to prevent mould or mildew from forming.

CLEANING AND DECONTAMINATION

Exterior trim surfaces suffer from much the same contamination as those that are painted, but the sheer variety of different surface types can make contamination removal more of a challenge. Tar contamination that can be removed easily from a glass window may prove impossible to remove fully from a woven fabric roof. A specific approach is required, paying close attention to firstly, the type of contaminant; and secondly, the surface that it rests on. Some materials will require gentle cleansing to avoid inadvertent damage, whereas others will resist more forceful (and therefore faster and more effective) measures.

SMOOTH PLASTICS AND PAINTED SURFACES

Smooth plastic and painted surfaces can be prewashed and washed in the usual way (*see* the section on exterior paintwork), but be mindful that strong chemicals, such as TFRs, may dull black paintwork and soft black plastics. Take care when using an abrasive cleaner, as the potential for permanent damage is always present. Fine-grade clay bars may be used, in conjunction with a suitable clay lubricant, but always proceed with caution, and test on an inconspicuous area first. Iron removers will generally be fine to use, although the mild exothermic reaction that occurs may be detrimental to very soft, high gloss or otherwise sensitive finishes.

TEXTURED PLASTICS

Ensure that any pre-wash or wash is residue free – do not get a product that ‘polishes’ or ‘waxes’ as well – and avoid washing-up detergents because these will invariably contain salt, which could be unsightly if it precipitates out; it can also expand and contract in any tiny cracks and pores found in UV-damaged plastic surfaces. Abrasives should be avoided at all costs: not only will they be likely to ‘dust’ due to the textured surface, but they could create shiny ‘flat spots’ in the finish, or other unsightly irregularities. This means that clay should also be avoided – although iron removers may be suitable – especially on newer, harder, non-UVdamaged textured trim. Finally, black textured trim will be susceptible to fading, not just from sun damage, but also by the action of strong chemicals such as TFRs. A gentler cleaning approach is advised with older plastics.

CLEAR PLASTICS

Strong chemicals and harsh abrasives should be avoided with all types of transparent plastic, although the softer materials used for convertible roof windows will be particularly susceptible to damage. Washing with gentle pre-wash products and maintenance shampoos should be all that is required to clean clear plastics, although an abrasive-free solventbased glass cleaner or abrasive-free quick detailer could be employed if contamination is particularly heavy. Should cleansing reveal a scratched or opaque surface, restoration could be carried out using mildly abrasive materials and techniques; further cleaning is unlikely to improve the situation and may even be counter-productive.

GLASS

Tinted window film may be seen when viewing the top edge of a piece of glass. If no join can be seen, the tint is likely to have been sprayed on.

Glass can cope with more abrasion than plastics and painted finishes, but watch out for shampoos, cleansers and polishes with glaze oils or waxes in. If the product used is not made specifically for glass and it is applied to a windscreen, smearing may result when it next rains (potentially causing dangerous visibility issues). If you do use a general purpose ‘wash and wax’-style shampoo on glass, remember to polish or clean the windscreen afterwards using a dedicated glass product; check the screen after, using the windscreen washer jets/wipers, and if it is still smearing, use a solvent to remove the offending residue. You’ll need to dry the screen thoroughly as well, to avoid water marks – pay particular attention to windscreen rubbers that can ‘trap’ water and release it on to dried paint or glass later on. Winding side windows down a fraction may allow you to clean the entire glass area, but remember to wind them up again after cleaning the top section. If using a spray cleaner, watch out for ‘bounce back’ and overspray – glass is a hard surface and a windy day will carry product droplets even further; if needs be, spray the product on to a microfibre cloth first, then apply it.

Finally, it is worth noting that the rubber, plastic and metal trim surrounding glass may not be as resilient as the glass itself. Strong abrasive glass polishes may stain or micro-mar these adjacent surfaces, so care should be taken to limit the application of glass products to the glass area only. A toothbrush and mild detergent/APC may prove to be effective in terms of cleaning window rubbers, and this process may also be helpful in removing any polish residues inadvertently applied to window rubbers/seals during the glass cleaning process. A dedicated biocide/mould remover could also be used if removing algae or moss, to help prevent it from returning; many caravan or soft-top convertible roof cleaning solutions will contain ingredients of this type if a dedicated product is not readily available, or a bleach solution could be used.

Be mindful when tackling glass that tinted windows may be covered in a thin plastic film (which provides the tint), and that this will be far more susceptible to scratching than bare glass. If you suspect that glass is tinted with a film (small dots or bubbles are tell-tale signs, and the film may even be seen when viewing the top edge of the glass) then avoid abrasive products such as glass polishes on the inside surface of the glass (where the film is normally applied), and use abrasive-free glass cleaners only, applied with light pressure.

METAL AND METAL FINISHES

Metals are relatively reactive, so be careful when using strong cleaners. Gentle cleaning agents such as shampoos and detailing sprays will rarely cause issues, but strong acids, alkalis and abrasives may all affect the finish, especially if they are left to dwell for too long or are inadequately rinsed, if the metal is ‘soft’, or if the metal surface has been refinished (for example, plated or anodized). Note that bare metal surfaces should be dried thoroughly after washing to help prevent rust, and that washing-up detergents (used as a cheap wash or pre-wash) may contain large amounts of salt that can also accelerate corrosion.

RUBBER

Only the softest rubbers will be affected by strong solvents; most will simply benefit from the more aggressive cleaning action. This means that strong shampoos and all-purpose cleaners are good rubber cleaners, and even acidic and alkali solutions (as often found in wheel-cleaning products) may prove effective, with little to no negative consequences. Abrasive cleansers and polishes should not be used, however, as rubber can tear and become stained.

FABRICS (INCLUDING CONVERTIBLE ROOFS AND TONNEAU COVERS)

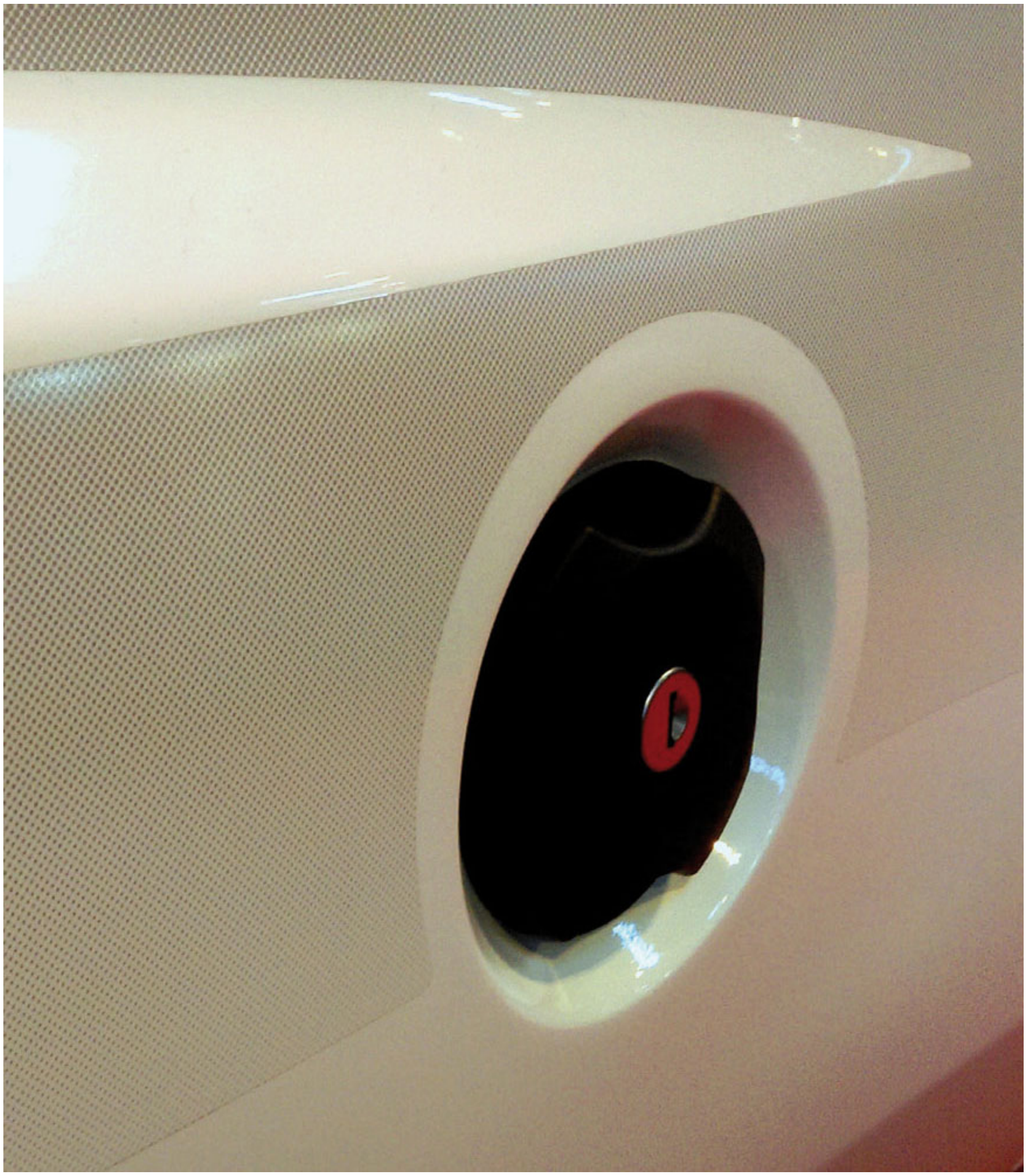
Exterior fabrics can be washed gently; never use a pressure washer at close quarters, and avoid jetting water into the seams, but let the water run over them with an open hose. They can also be wet vacuumed and steam cleaned extremely successfully, although a dedicated (or suitable) textile-cleaning product should be used for deeper cleaning (instead of, or in addition to, water). Typically, All-Purpose Cleaners fulfil this role well, being a blend of detergents and solvents, but as long as the solution does not break down the fabric (as would be the case with strong acid solutions) or stain it (as may happen with abrasive products and aggressive solvents that may attack any dye that is present), then a wide range of shampoos, cleaning liquids and even scouring powders could potentially be used (although the latter can be very aggressive and potentially destructive to sensitive finishes). Note that ‘high foam’ products may be difficult to rinse out of absorbent fabrics after washing, and will continue to foam during, or even after, an extended rinse process. The use of a low- (or non-) foaming product should therefore be considered if this issue is encountered. Be wary of ‘gloss-enhancing’ shampoos as well, because these can result in sticky residues being left behind, which can attract dirt. A low foam, low gloss product is therefore ideal.

With regard to equipment, a short-bristled brush of medium softness will work well during the wash process, helping to agitate dirt from the fabric’s weave. Toothbrushes are ideal for seams and stubborn spots of dirt. If a short-bristled brush is not available, a synthetic mitt or sponge will suffice (assuming the sponge has not started to fall apart). Wool mitts and deteriorating sponges will tend to leave debris behind on ‘rough’ and ‘grabby’ textiles, necessitating the remedial use of a lint roller or similar device. Likewise, never dry a fabric roof with a piled cloth after washing/rinsing, as fibres could be pulled out by the ‘rough’ hood texture, and these will invariably be time-consuming to remove.

VINYL FABRIC

Vinyl material is easily washed, having a natural smoothness and pliability, though ensure that any cleansers are free from abrasive residues as these can collect in the grain of textured surfaces. Dark vinyls will be susceptible to fading and they may also have become UV-damaged over time, making them more easily stained or attacked by strong chemicals. Solvents and aggressive alkalis should be particularly avoided.

VINYL STICKERS AND VINYL WRAPS



The edge of vinyl stickers will be susceptible to lifting if a solvent or strong detergent is allowed to attack the exposed adhesive; always work 'away' from edges rather than 'into' them.

Treat these as soft plastics and painted surfaces (*see* above). They will be extremely soft in material terms, and can scratch very easily. Take care around the edges of stickers with any product containing strong detergents or solvents, as these may try and 'lift' the edges. A pH-neutral maintenance shampoo solution is normally an effective choice, applied cautiously with a soft sponge or synthetic mitt 'away' from the edges rather than 'into' them. Avoid abrasive cleansers and strong caustic cleaners (such as TFRs). Abrasives will obviously mar the soft surface, but caustic chemicals invariably cause unlaminated vinyl finishes to fade.

MAINTENANCE, ENHANCEMENT AND PROTECTION

Assuming that the surface is clean, it will need treating with products to enhance the finish and provide protection. If it needs to be cleaned or decontaminated, refer to the section above.

SMOOTH PLASTICS AND PAINTED TRIM SURFACES

These surfaces can benefit from the application of trim dressings and glazes, although smooth plastics should not be subjected to any form of abrasive action at all – therefore be wary of polishes and 'all-in-one' products that may contain micro-abrasives as well as glaze oils. Even a mild abrasive can alter the texture of smooth plastic and result in a permanent change to the finish, as well as the possibility of 'dusting' (when pale powdery deposits can be seen). Detailing sprays may also be used, although these will rarely be as glossy as their trim dressing counterparts. Watch out for 'sling' with trim dressings, where the coating does not fully dry and can rub off on contact, or streak down the side of neighbouring paintwork if it rains – this is a side effect of water-based silicone emulsions, which often place gloss above adhesion as the most desirable attribute.

Avoid 'forum favourites' such as peanut oil, and hand or face cream, because the initial gloss and coverage will invariably collect dust and dirt, and the short-lived dressing may also streak in the rain. Specialist trim dressings are generally a wiser choice – although black shoe polish may be surprisingly effective and worth considering.

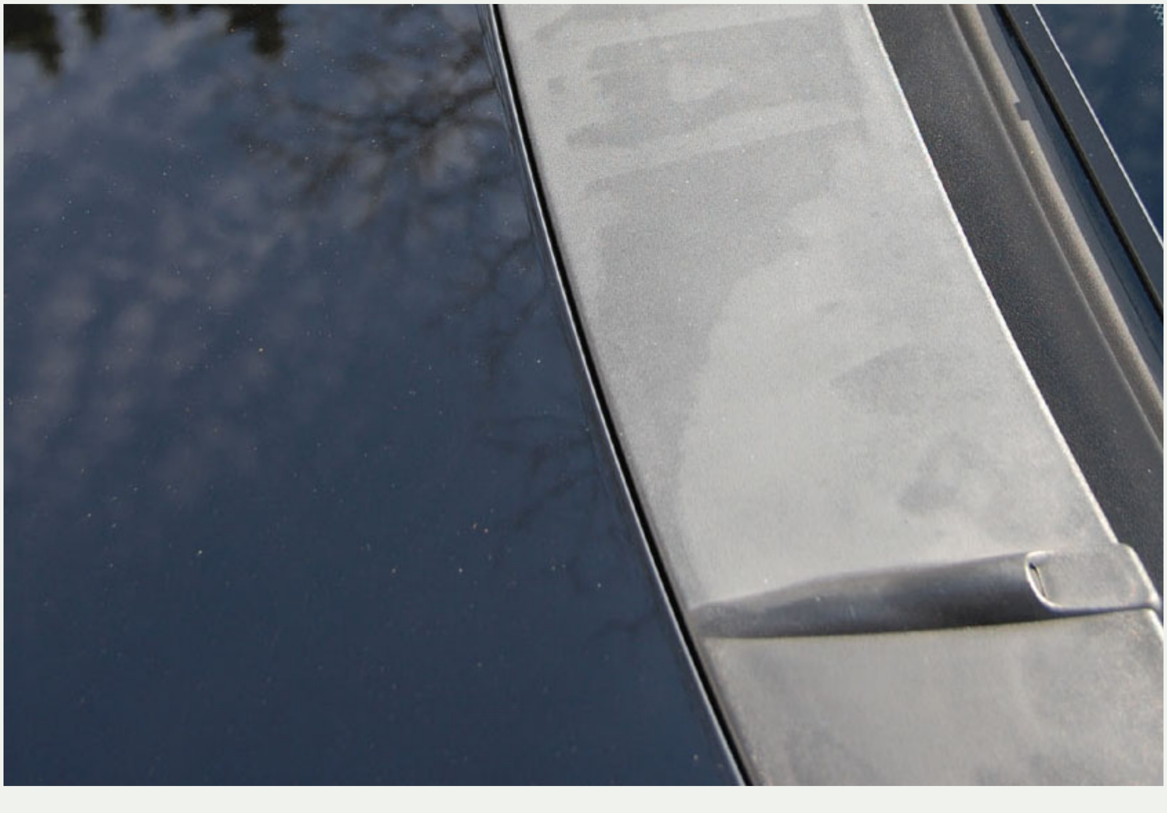
Trim dressings can radically improve the appearance of trim, but the finish will rarely last; trim sealants have a better record for durability, longevity and UV resistance.

To protect the trim, use a dedicated UV protectant (to help prevent trim fade) or a trim sealant; do not use a traditional wax meant for paintwork (unless it is obviously painted trim) because there is a likelihood of it dusting when the solvents and oils have fully evaporated (this is especially noticeable on textured trim – *see* below). The application of dedicated trim sealants will vary depending on the type of product employed – these can range from relatively low-durability silicone oil dressings to extremely high-durability nano-ceramic/quartz or resin coatings, so follow the manufacturer’s instructions and take note of any relevant forum feedback or advice.

Note that as durability increases with trim sealants, ease of application tends to diminish, and inconsistent results may be seen if the sealant is applied to faded trim – the oilier, 'wetter' products tend to cope with faded trim more consistently, because the oils saturate the damaged plastic surface completely rather than 'sitting' on it at different levels or thicknesses.

Removing trim products that have given a poor finish can be difficult, so identify firstly, how UV-damaged (faded) the trim is; secondly, how consistent the fading is, if any; and thirdly, how well the trim sealant may cope with the degree of fade. Fresh plastic on new cars will often take high-durability trim sealants readily and give great results, yet few products will look good on highly faded twenty-yearold trim. In the latter instance, painting the trim or replacing it may be a better option than trying to restore it (*see* below).

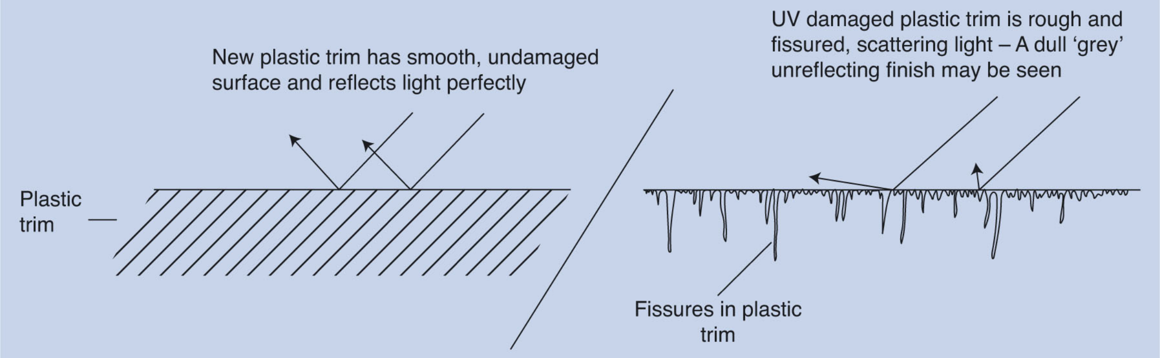
FADED TRIM: THE PROBABILITY OF PATCHINESS



Sunlight fades plastic trim and makes it brittle; if the damage is severe the finish may be inconsistent after the application of trim dressings or

sealants.

Black plastic trim is particularly susceptible to UV degradation – the black colour means that it absorbs a lot of UV radiation rather than reflecting it, the surface area is higher than for smooth plastic, and the plastic material itself may be inherently ‘soft’ in order to ensure that it is flexible and will not crack. Repeated exposure from UV and infra-red radiation from the sun will eventually break the molecular bonds that give the plastic its structure, causing it to become pitted and fissured. The ‘roughness’ diffuses and reflects light in a different manner to ‘fresh’ plastic, meaning that black plastic can eventually end up looking grey. Unfortunately, UV fading is rarely consistent – indeed, many car owners would probably find a *consistent* grey finish acceptable. The problem is that any kind of contaminant or coating on the surface – a splash of oil here, some tree sap there – can shield the underlying plastic and give it a localized area of temporary UV protection. Upper areas to plastics, radiused edges and other moulded features may also attract more attention from the sun, and therefore be degraded to a greater degree.


New plastic trim has smooth, undamaged surface and reflects light perfectly
UV damaged plastic trim is rough and fissured, scattering light – A dull ‘grey’ unreflecting finish may be seen
Plastic trim
Fissures in plastic trim

UV-damaged plastic trim.

When a coating is applied to a UV-damaged plastic surface, the oils will sink to the depths of the fissures, resulting in a different finish to the less damaged areas. Decontaminating the deeper fissures may also be very tricky as the oils may be almost impossible to remove, and could even become trapped and then ‘sweat’ out at different ambient temperatures as the plastic expands and contracts.

To summarize, faded trim is one of the most difficult areas of a car to treat consistently – newer plastics are far easier to attend to. Old trim could therefore be repainted or replaced to avoid the pitfalls of inconsistent finish that inevitably await the unwary detailer. Use a suitable flexible paint for painting plastic trim; many automotive ‘rattle-can’ sprays will be fit for this purpose.

TEXTURED PLASTICS

Dressings for textured plastics tend to be of the same nature as those for smooth trim; after all, it is usually the material (plastic) that dictates the make-up of the product. However, it is even more important to avoid abrasive or ‘dusty’ products with textured trim; abrasion will swiftly alter the appearance of the trim permanently, and any product with an opaque solids content will dry to leave a dusty residue in the dimples or depressions of the trim surface. As for smooth plastics above, use dressings and sealants according to the manufacturer’s instructions, ensuring that the trim is clean first.

Note that cleaning textured plastic trim is far more difficult than cleaning smooth plastic surfaces, and any failure to clean the trim properly could cause inconsistent results when a dressing or sealant is applied.

CLEAR PLASTICS

Gentle cleaning of clear plastics with non-abrasive materials and mild chemicals is enough for regular maintenance, but they are rarely enhanced or protected as heavily as painted surfaces. This could be because there are fewer products generally available, because the roles of clear plastics on a vehicle are more diverse (from headlamp clusters to convertible roof rear windows), or maybe because there is a less obvious need to look after them. When products are available, these tend to be either abrasive-based kits to remove swirls or yellowing (effectively restoration, discussed below), or sealants to guard against UV light and contaminants (protection), with ‘Aerospace 303’ being a noticeable example. What this means, of course, is that the enhancement of clear plastics is really quite uncommon – no one sets out to ‘glaze’ clear plastics to improve the shine or hide the effect of swirl marks or scratches, although this could always be the inadvertent result of attempting a full restoration and falling short of the desired result.

The application of protection products will depend on their specific instructions, but they will normally be applied to a clean, possibly solvent-wiped surface, to maximize the longevity of the coating. If sprayed directly on to the clear plastic surface, they will most likely be levelled/buffed shortly afterwards, using a soft, lint-free microfibre or microsuede cloth. An uneven coating of sealant is likely to be visible (due to the potential difference in light refraction that will result), so it is important to level the coating successfully and buff it until it cannot be seen.

GLASS

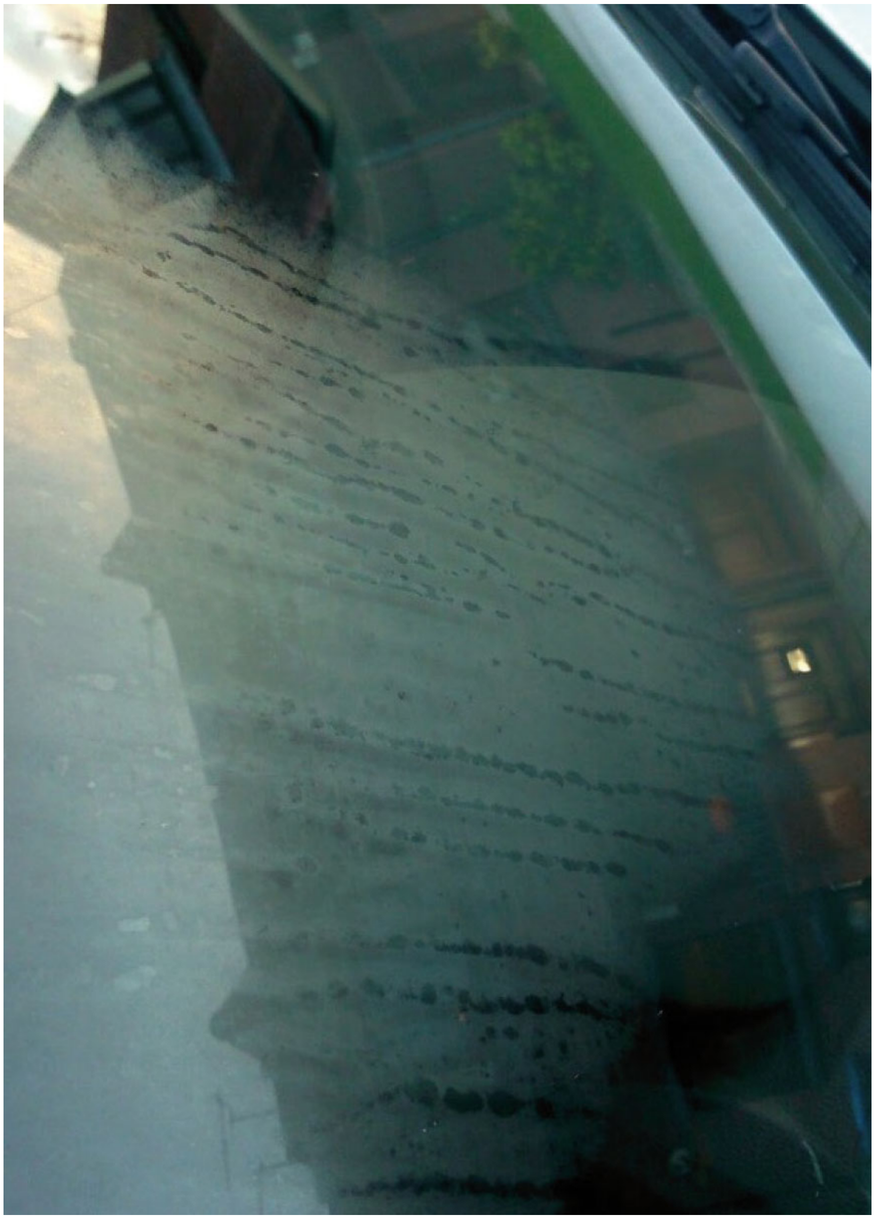
Glass sealants tend to be super-hydrophobic, clearing water droplets effectively. This may improve visibility in heavy rain.

Glass (as used for windows and the windscreen) is rarely dressed, but is regularly cleaned and occasionally sealed. The decontamination and cleaning of glass is covered above, so this leaves ‘sealing’ it. Note that glass does not need, or get, a lot of additional protection from coatings: it is already a far harder material than waxes or sealants themselves. Should glass need to be protected, say from stones, then a physical barrier such as a stone protection film, or stone guards of a mesh/metal nature, would usually be employed. Sealing glass is therefore undertaken not to protect the underlying surface, but to improve visibility and reduce maintenance effort, by making the glass surface more water- and contaminant-repellent.

The glass that is going to be sealed must be 100 per cent dry and decontaminated to ensure that the glass sealant can bond sufficiently to the surface – a waffle-weave microfibre cloth will be ideal for this, being both absorbent and relatively aggressive in nature. It is also important to clean or replace the wiper blades if applying glass sealant to the windscreen – use a residue-free detergent or mild solvent for this task, never a rubber dressing, which could cause smearing. Abrasion from microscopic dirt particles is far more likely to remove the sealant coating prematurely than UV light.

Once the glass is cleaned (a final wipe with isopropyl alcohol or other solvent is recommended), the glass sealant can be applied according to the manufacturer’s instructions, using a clean cloth. Do not use tissue paper/kitchen roll because paper can be abrasive, affecting even a very hard material such as glass (historically, newspaper used to be favoured, but modern waffle-weave microfibre cloths offer far higher performance with less risk of inadvertent damage). Apply using an overlapping circular motion, as this will ensure complete and even coverage, and apply a second coat if it is recommended.

Many of the highest-performing glass sealants are based on covalent silane technology, where the sealant forms an atomic bond with the (relatively reactive) glass surface. Glass is far less inert than paint or plastic, so the right chemistry can lead to spectacular durability/longevity due to improved adhesion. Once the glass sealant has bonded to the glass, the super-hydrophobicity of the surface means that rain droplets bead and disperse rather than breaking up on the surface and clearing from the windscreen slowly (although avoid getting the coating wet for at least twenty-four hours, if possible – glass sealants should fully cure before being pressed into action if they are to offer maximum performance and longevity). The human eye can see through sealed glass more easily during a downpour, making the use of wipers less of a necessity in heavy rain than would normally be the case.



Smearing and juddering are two potential side effects of glass sealant application, but they can usually be avoided.

Note that there are two potential side effects reported when glass sealants are applied to windscreens: first, the smearing of raindrops; and second, the juddering or skipping of wiper blades on the glass. The first symptom can eliminate any potential benefit in terms of improved visibility, and the second is, quite simply, highly annoying. The cause of smearing could be because the glass is not sufficiently decontaminated (perhaps due to a failure to clay), because a glass sealant has been applied previously and then not been fully removed (preventing a subsequent layer of sealant to bond fully), or because the wiper blades are contaminated or worn. In the latter instance, water droplets are broken down into smaller water beads when the wiper blade covers its arc, with thousands of microscopic water beads giving the impression of a general water ‘smear’. If the wiper blade had a clean, regular edge, or if it was clearing a clean and regular surface, the beads would have nowhere to go and would be efficiently removed during the blade’s travel. Instead they are roughly ‘torn’ into smaller beads.

As for judder or wiper blades skipping, this can be down to the sealant having cured insufficiently, the wiper blades having been inadvertently softened by the action of a strong chemical (perhaps during cleaning), or simply because the wipers are worn and/or the glass contaminated. Replacing the wiper blades and/or wiper arms, is relatively cheap and easy to do and should be considered, especially if cleaning the wipers thoroughly does not elicit a cure.

METAL TRIM SURFACES

Anodized aluminium metal surfaces are very sensitive, and can be stained or removed by aggressive detailing products and techniques.

Check that the metal trim to be enhanced or protected is, in fact, made from real metal, even if just a metal veneer. Many items of ‘chrome’ trim are actually plastic trim pieces painted in chrome paint, and therefore need to be treated as such. Mistaking them for a more durable metallic material is likely to lead to a more aggressive treatment regime than would otherwise be advised.

If the metal trim is painted or powder-coated, usually in a matt or satin black finish, then it can be treated like painted trim. If the surface is genuinely metallic, you will need to establish what the metal is likely to be, and whether it has been refinished (for example, whether it is anodized or plated). Softer metals such as aluminium will scratch or mark more easily than harder metals such as steel. Aluminium could be anodized (a form of electro-painting), and steel could be chromed, or even silver- or goldplated. A thick chrome plate is going to be very hard and durable, but a poor quality chrome finish could see the plating at risk of being accidentally removed.

Other types of refinishing include any surface patterning, such as machine-turned finishes, etching or engraving. These are often just a few microns deep and can be damaged or removed by overly aggressive maintenance products and/or processes.

Most maintenance of ‘standard’ metal trim involves polishing of some kind, because metals tend to be reactive and when they oxidize in contact with air they become dull and lose their shine. Polishing removes the oxidized upper layer and exposes fresh metal beneath – but be aware of the potential damage that could be caused to coated/anodized, thinly plated or very soft metals. The harder the metal, the more aggressive the polish that can be used – and as with polishing paint, it is often worth ‘stepping up’ to coarser compounds from the finer-grade polishes you start with, to speed up the cutting process. Once the metal has been cut, it may require a refining stage (or stages) by ‘stepping down’ through less aggressive polishes until a mirror-shine, free from micro-marring, has been achieved.

The protection of polished metal trim is difficult; some waxes or sealants may give some temporary protection from oxidization, but they find it difficult to bond to a freshly polished surface. If attempting to seal the surface, always wipe with IPA (or similar solvent) to give the best ‘key’ possible: this helps to remove any oils left over from the polishing process. Thick resin coatings may offer the best protection, but can give an optical ‘rainbow’ effect on some metals; nano-ceramic sealants, hybrid waxes or spray sealants may prove less durable but are easier to apply, and have less chance of altering the finish. Metal can be lacquered/clearcoated, but this will tend to flake off prematurely because paint finds it difficult to attach itself to ultra-smooth mirrorpolished metal.

Anodizing bare aluminium, or painting/powdercoating bare metal surfaces are other options, but a freshly polished 'mirror' finish cannot usually be replicated this way. Ease of maintenance (and the potential benefit of never having to polish the metal again) is traded for a slight compromise in overall finish.

RUBBER

Many tyre, rubber trim and plastic dressings are interchangeable, but ensure that a 'dry' finish is achieved – finishes that are wet to the touch after application can collect dirt and 'sling' (they come off with contact or vehicle movement).

Rubber trim can be found internally and externally on the car, from rubbing strips on bumpers to seals around the inside of the doors. Internal rubber trim that isn't exposed to sunlight needs less protection than those items of trim on the exterior of the car. Like plastic, rubber comes in different grades and can also exhibit signs of degradation over time (typically in the form of cracking, disintegration, or going hard/brittle). Harsh solvents can also attack certain types of rubber, so ensure that any rubber ‘food’ or dressing is a gentle formula containing mild solvents only.

Keeping rubber clean is the basis of good maintenance, because it is a relatively rough material at a microscopic level and therefore capable of trapping a lot of dirt on its surface; sticky or unctuous dressings can also help trap dirt. Besides looking unsightly, trapped dirt could be abrasive and may potentially mark the rubber if allowed to become ground in. Specific rubber sealants are rare, although flexible trim sealants with low to moderate solvent strength could be employed, as could tyre sealants. Far more numerous are the dressings available, whether rubber ‘food’ or generic trim dressings. These are simply applied to clean, dry rubber and tend to help elasticize the material, increase water repellence (and fluid retention) and provide a level of protection from a broad variety of contaminants as well as UV light. Ideally these treatments should be left until dry to the touch, since stickiness traps dirt. If the rubber feels ‘wet’ after application, allow an hour or so for the dressing to sink in, and then wash the rubber with a mild shampoo solution, before allowing it to dry.

These dressings should also result in an attractive finish (from matt to high gloss, depending on personal preference) and be as durable as possible. Trim dressings are not renowned for durability, so frequent reapplication of rubber treatments should be anticipated. And just as with plastic surfaces, be aware that old or degraded rubber trim could lead to an inconsistent, ‘patchy’ finish. If the rubber has cracked badly, or started to powder and disintegrate, it is best to replace it completely, rather than persevere with its preservation. Note that rubber wiper blades should not be dressed, they should just be cleaned with a mild detergent, mild solvent or APC (at suitable dilution) – any form of dressing is likely to cause smearing when the wipers are used.

FABRICS (INCLUDING CONVERTIBLE ROOFS AND TONNEAU COVERS)

Using a brush to apply a fabric hood sealant helps the sealant to penetrate the material and protect it fully, and it also helps to get it in and around flaps and seams. A spray will be less effective here.

Exterior fabrics – that is, convertible roofs and tonneau covers – may need re-dyeing occasionally as part of a restoration regime, but regular maintenance or enhancement is unlikely. They just need to be cleaned and then protected. Sealing fabric roofs is important because the dye within the fabric fibres could fade with UV light, plus the material itself is going to be subject to the vast range of outdoor contaminants that also punish paintwork. Luckily, dedicated fabric roof sealants do exist, for application to a dry and clean surface. These can be sprayed, rollered, or brushed on, but brushing them on with a short-bristled brush may allow them to penetrate the fibres better (if the product comes in a pumpstyle spray rather than an aerosol, consider decanting it and applying it with a brush – you may use more of it by brushing it on, but the residual protection should be better, which would compensate for the higher usage).

Multiple coats of a roof sealant may increase protection, although this does depend on the product itself – and for best results you may need to apply secondary coats after the primary coat has fully cured (which may take perhaps as long as twelve to seventy-two hours).

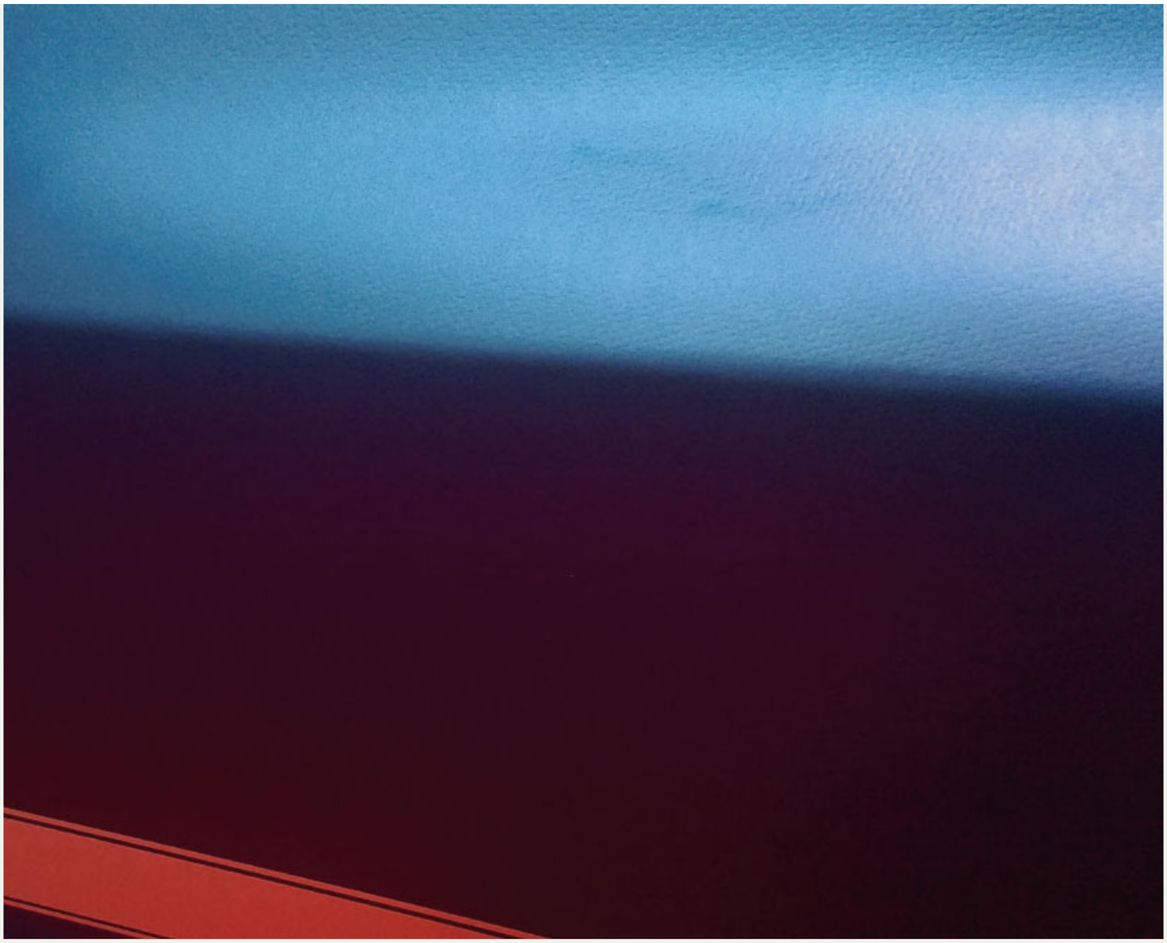
VINYL

For detailing purposes vinyl stickers should be treated like soft paint.

Vinyl shares some chemistry with paint, which is why ‘vinyl’ paints can be found in hardware stores. Being a plastic, like paint, means that it can be cleaned, enhanced and sometimes restored in a similar way. Vinyl roofs found on some convertible ‘soft-top’ cars are made from a much tougher, moulded material that will be bonded to a fabric material. This ‘grainy’ vinyl may be mildly enhanced with plastic treatments, and even waxes or sealants, but the surface will never be smooth enough to lead to a mirror-like shine, as would be the case with paint. These vinyl roofs can be protected using plastic sealants, especially those with an anti-UV function to guard against the sun’s rays – the black colour most commonly used for vinyl roofs is adept at absorbing this radiation, increasing the chances of degradation.

Vinyl stickers and vinyl wraps are found on many cars these days, and this material can be treated like a ‘soft’ paint. Unlike the vinyl found on convertible roofs, this material can often be glazed or polished to increase gloss and remove micro-marring – although extreme care should be taken, as unlaminated and printed vinyls will be far more susceptible to colour loss or fade, and there may be a high chance of permanent damage to the vinyl. To maintain them, use abrasive-free detailing sprays or dedicated plastic ‘trim’ products. Strong chemical cleaners, such as TFRs, can fade vinyls aggressively, causing similar damage to that inflicted by the sun (UV damage), but in a matter of minutes rather than weeks or months. Swirl removal will be possible in many cases, using mild abrasives (*see* below), and vinyl can be protected using a dedicated plastic/trim sealant, or traditional ‘paint’ waxes or sealants – although it is best to use products with a ‘gentle’ solvent content to avoid potential issues: some vinyls may react to aggressive solvents, becoming susceptible to dirt ingress, softening, or colour loss/fade. And remember: always wax *along* vinyl strips rather than across them, to minimize residue build-up.

MATT VINYL: LESS IS MORE. . .



Many car owners find matt vinyl difficult to detail, but technically it may require fewer processes and products than an equivalent gloss finish.

Matt vinyl stickers and wraps have a certain popularity, and many owners are confused as to how to maintain or protect the opaque finish. The simple rule is that ‘less is more’. Choose a wash product that contains as few gloss-enhancing or protection (wax/sealant) ingredients as possible, as these will add unwanted shine. Do not clay or polish, as the abrasives will create shiny areas in the finish. To maintain, simply use an abrasive- and residue-free solvent-based glass cleaner, IPA or other form of mild solvent. Then consider a protection stage afterwards, using a dedicated ‘matt’ vinyl wax or sealant. Note that many of these will invariably add a slight satin sheen, and some form of compromise may have to be made between protecting the vinyl (this is perhaps less critical, as it is a protection product itself) and maintaining a matt finish. Of course, many ‘matt’ finishes are actually closer to ‘satin’ in reality, with a mild sheen, and some added gloss will be totally acceptable. As ever, the decision rests with the detailer.

SURFACE RESTORATION: RECTIFICATION OF DEFECTS AND IMPERFECTIONS

If external finishes get scratched or damaged, they can sometimes be repaired by the amateur (or professional) detailer. However, due to the variables in material composition and finish, this may not be as simple as correcting minor imperfections in paint.

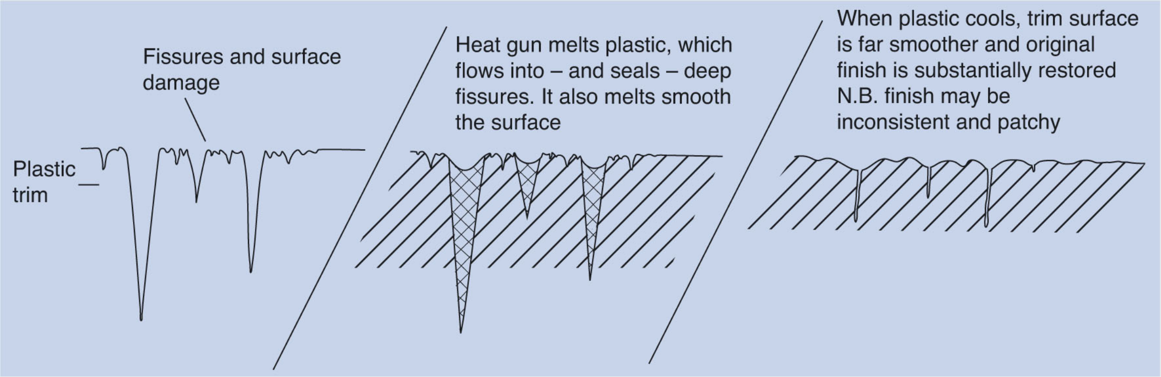
SMOOTH PLASTICS AND PAINTED SURFACES

Painted trim is unlikely to be clearcoated, but if it is a glossy finish, it can be corrected using standard paint techniques (as described earlier in the book). Matt or satin finishes cannot be polished, however, without the risk of creating additional and unwanted gloss: if this is likely to occur, the trim pieces will have to be repainted or replaced. Smooth plastic is trickier to repair. Assuming it is totally smooth, with no grain or texture at all, it may be possible to lightly machine-polish small scratches from the surface – although be cautious when doing so, because too much heat will damage the trim irreversibly. The alternative is either to paint the trim with a suitable automotive spray paint, or replace the piece of plastic trim with either a new or used equivalent. Note that dark plastic trim will often fade over time and replacing an isolated piece may look unusual: either use a second-hand piece of trim of similar age (in better condition), or replace all the surrounding trim with new pieces.

TEXTURED PLASTICS

It is impossible to machine-polish textured plastic without destroying the surface finish, so the only options will be either to paint the trim piece if it has faded, or replace it if it has been severely damaged or scratched. In the former case, an automotive spray paint of sympathetic finish, ideally sprayed over primer, will give a long-lasting result – and small scratches could even be filled with a bodyshop filling compound beforehand.

REJUVENATING FADED BLACK TRIM: THE PERILS OF THE HEAT GUN


Fissures and surface damage
Plastic trim
Heat gun melts plastic, which flows into – and seals – deep fissures. It also melts smooth the surface
When plastic cools, trim surface is far smoother and original finish is substantially restored N.B. finish may be inconsistent and patchy

Heat-gun action on UV-damaged plastic trim.

At some point, an enterprising car owner discovered that faded black plastic trim of a softer nature (as used for bumpers) could be darkened to a near-original finish using a high temperature hair drier or hot air gun (heat gun). The process simply involves melting the faded trim – which has become rough and degraded from UV (sun) damage – in isolated patches, ‘popping’ it back to a new-look finish. All that is required are a few seconds of the heat gun operating at a high temperature, about 10–15cm from the trim. The molten plastic flows into the microscopic pits and fissures in the degraded trim, and melts many of the high points that were reflecting light in an irregular fashion (and therefore causing greyness).

The reason this technique is not recommended is because it is too inconsistent. The plastic melts in patches, and the chances of an aesthetically pleasing, consistent finish is unlikely. Attempting to achieve a good result over a medium- or largesized area is a time-consuming exercise, and it is far more effective to mask the surrounding area and then to paint the trim piece with a spray can.

CLEAR PLASTICS

Mildly abrasive plastic polishes designed to rejuvenate clear materials should be employed, either by hand or machine – although note that machine polishing should be carried out extremely carefully as excessive heat will ‘cloud’ or melt the sensitive surface. Strong solvents also have the capability of removing scratches and damage from soft materials, but at much greater risk. There is a high chance of creating a permanent, inconsistent finish, and therefore ‘chemical’ correction is not advisable unless you have particular skills or experience in this area.

Removing Scratches from Headlight Covers

One of the most common restoration tasks involving clear plastic will be the rejuvenation of polycarbonate headlight covers. These get scratched and UV-damaged over time, becoming opaque and cloudy. Because they tend to be made from harder types of clear plastic, they can respond well to restoration; and if the worst should happen and the restorative process fails to have the desired effect (or makes things worse), the headlight lens – or even the whole headlight unit – can usually be replaced relatively economically. Dedicated headlight restoration kits are quite common, although sanding paper and machine-polishing pads/polishes may be capable of delivering the required result.

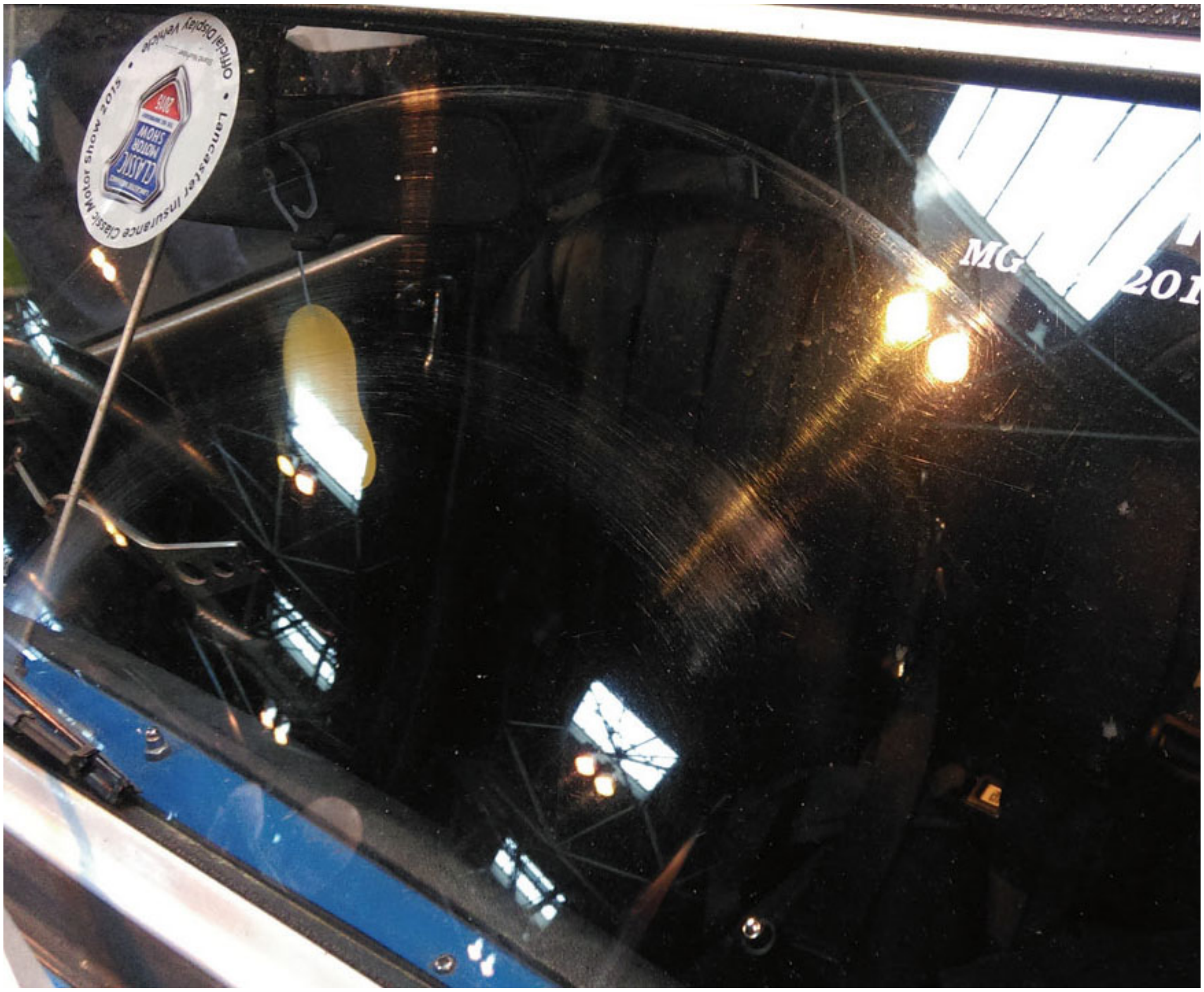
You will need the following:

- A headlight restoration kit, or wet and dry paper (P2000, P4000)
- Clay lubricant
- A selection of machine polishing pads (preferably smaller ‘spot’ pads) and polishes

Seven-Step Method

1. Clean the headlight lens thoroughly, by washing it with car shampoo and then claying it. Rinse and dry the lens.
2. Isolate the working area by masking around the headlight unit; bodywork can meet the headlight unit at sharp angles, and sensitive paintwork and trim could be damaged if a machine polisher makes contact with them.
3. Use a heavier grade wet-and-dry paper (perhaps P2000) with clay lube, to sand the lens and remove deep UV damage, scratches and stone chips; rinse thoroughly with water.
4. Repeat the sanding process with a finer grade wet-and-dry paper (such as P4000); this will remove some of the sanding marks created previously.
5. Choose a medium- or heavy-cut pad and medium-cut compound, then machine polish the lens at low speeds and moderate pressure, being careful not to generate too much heat. A slow ‘grinding’ cut may work better than a fast ‘hot’ cut.
6. Use a fine-cut pad and polish to refine the finish; use lighter pressures and slightly higher speeds, but again, avoid generating too much heat. If you see the lens start to cloud or go dull, stop immediately; this is likely to be heat damage forming inside the plastic, rather than dullness/damage on the surface that can be removed.
7. Wipe the lens with a mild solvent to remove polishing oils and to check the true level of correction. After a good finish has been achieved, seal the headlight lens with a UV protectant (such as Aerospace 303) or polymer sealant.

GLASS



Glass is a tough material – tougher than paint – but it can be scratched. Wiper blades may drag hard contaminants across the surface in an arc, so try and keep them as clean as possible.

Scratches in glass will be far more difficult to remove than the equivalent micro-marring or scratching in paint, simply because it is a far harder material. It may seem odd that it can be scratched in the first place, but natural contaminants such as quartz (found in grains of sand) will be of an equivalent or greater hardness, and when dragged across the screen by windscreen wiper blades can cause noticeable marks and scratches. Cleaning the wiper blades every time you wash the car is a prudent exercise – and be cautious when using any abrasive product, applicator or cloth on glass. It may seem like a very tough material, but kitchen scrubbing pads and even paper towels may mark glass if used aggressively, especially if applied unintentionally in combination with surface contaminants.

Glass may also be etched and chipped, typically by bird mess and gravel stone chips, respectively. Whilst it is almost impossible to avoid stone chips (although keeping a safe distance from vehicles on loosely surfaced roads will certainly help), removing bird mess quickly and expediently is important if you want to keep glass in perfect condition. Do not let it dwell on glass – just as you wouldn't let it dwell on paint – and dilute it with plenty of water as soon as possible. Bird mess can then be removed fully using glass cleaner, detailing spray or all-purpose cleaner: use detailing spray if the mess looks dry or gritty, because the spray is likely to contain lubricants, then clean the area with a glass cleaner afterwards to remove any traces of unwanted glossing agents that may lead to subsequent smearing.

It is not advisable to try and remove scratches or etching in glass, although it is technically possible. Whilst glass can be machine-polished using cerium oxide as a polishing compound in combination with fibrous glass polishing pads, it is not an advisable course of action for amateur detailers; there is a significant chance of sling (splatter) on to surrounding areas and cerium oxide is highly abrasive (meaning that it may readily damage the surfaces it lands upon, when residue removal is attempted). With comprehensive masking of surrounding areas, the correct glass polishing equipment/products and adequate expertise, glass can be polished until no scratches remain, but it is recommended to employ a professional detailer or glass technician to carry this process out (over-polishing glass may lead to strange optical irregularities). The 'glass polishes' found on high-street shelves will not be suitable; these tend merely to deep clean the glass, rather than remove imperfections such as etching, marring and scratches.

METAL SURFACES

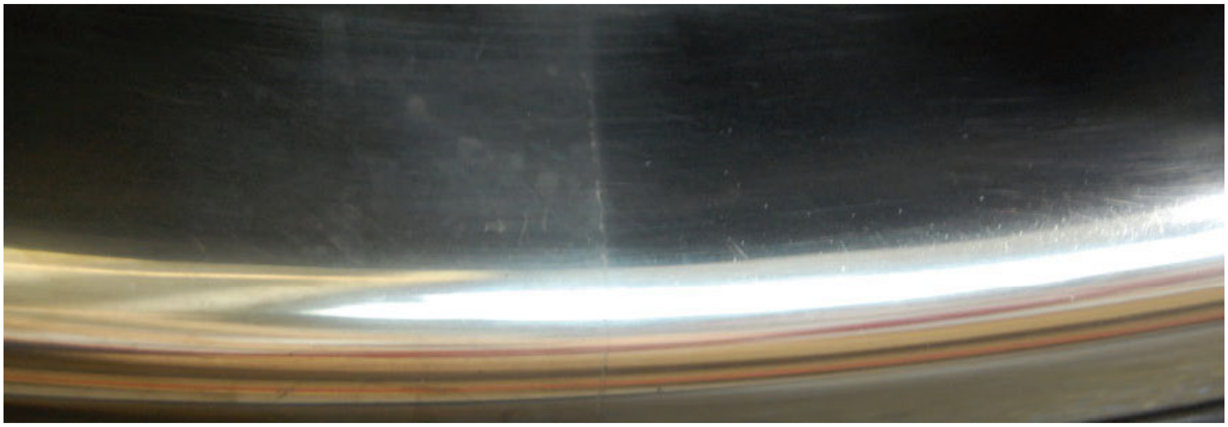
Metals display different densities/hardness, and may suffer from many types of corrosion and contamination. However, all are able to be polished and repaired, making metal a relatively forgiving and compliant material to work with. We shall deal with restoration of specific defects individually.

Rust

Rust is detrimental to the appearance and integrity of metal components. However, it can be neutralized and removed in most instances.

Surface rust (ferrous oxide) can be removed with specialist chemicals and gentle abrasion from fine-grade wire wool or a similarly abrasive material. An underlying spot of rusted metal may be the source of a larger area of surface rust, perhaps where thin chrome plating has been breached. Residual rust needs to be chemically neutralized using more rust remover or rust ‘converter’ and then cleaned, before being protected by fresh paint, powdercoating or plating. If this cannot occur, oil or wax may help prevent rust from returning – although under no circumstances should brake discs be treated in this way. Note that some pitting may have occurred to the original metal surface, especially if rust has been in attendance for a long period of time. In severe cases metal may need to be replaced, or in milder (cosmetic) instances repaired using bodyshop filler. Structural metal components should always be replaced if they appear to have been weakened by rust.

Scratches



Waffle-weave microfibre cloths can be used with a metal polish to remove minor scratches and corrosion, and create a 'mirror finish'.

Assuming that the metal surface is not plated or coated, the prognosis for correcting scratches in metal is good, and they will generally polish out given the right technique and materials. Light scratches in softer metals may just require the application of a gentle metal polish via a mildly abrasive cloth (a waffle-weave microfibre is suggested, as these have a reasonable 'bite' compared to plusher cloths). As the cloth blackens with metallic residue, a lustrous shine will be created and light scratches are likely to be cut back or completely removed. Deeper scratches on harder metals will be far tougher to 'improve' or eliminate entirely; this will require the use of heavier abrasives and cutting techniques (perhaps fabric polishing 'wheels'), followed by 'lower cut' refinement stages to remove the marring that will inevitably have resulted.

Etching

As with scratches, etch marks need to be polished out – but they can be quite deep and could be difficult to remove. Polishing the metal to a point equal to, or beyond, the depth of the scratch will be required, followed by refinement stages to remove the residual marring and to create a perfect shine.

Dullness

Tarnished metal suffering from light oxidization or any other mild form of surface degradation will appear dull and unreflective, but in most cases it will be easy to polish, requiring the minimum of attention. Unless the metal is particularly hard or the surface deposits particularly stubborn, fine-cut metal compounds and polishing techniques will be adequate at removing the unattractive surface coating, revealing 'fresh' metal underneath.

RUBBER

Once rubber perishes, either by cracking and becoming 'brittle' (often due to UV damage) or by becoming gummy and sticky (perhaps due to the action of a solvent), it will need replacing. It is highly unlikely that it will be possible to repair it. Small scuffs and scratches in soft rubber are also tricky to repair, because the surface will probably tear or mar if an attempt is made to sand it. Hard rubber, however, may benefit from sanding with increasingly fine grit sandpapers to improve the appearance of the scuffed area. Applying a trim dressing afterwards will enhance the finish even further, although it may never be possible to achieve a perfect finish.

FABRIC

If fabric roofs show deep staining or algae penetration, a suitable detergent, dedicated biocide/mould remover or APC may be used to good effect when applied with a short-bristled brush (although watch out for staining or bleaching effects on dark hoods). However, if the fabric is torn or cut, the material may only be repaired easily if the hood comprises a single skin. In these cases, applying glue, stitches or a patch to the underside of the fabric may offer a suitable – if potentially unsightly – solution. There is a greater chance, however, that the hood is constructed from multiple layers of material. The advice or services of an expert trimmer should be sought in these situations, and a replacement hood considered if the damage is too great. Faded but intact fabric roofs can be re-coloured using the correct dyes and fabric paints, restoring them to near-original condition. Cleaning the hood thoroughly before application will be essential, and sealing the hood afterwards would be advisable. Also, be aware that the stitching may not be re-coloured to the same degree as the roof fabric.

VINYL

Vinyl stickers or wrap will be irreparable if cut or torn – though they are often easily replaceable – but they can usually be machine polished ‘clear’ if minor swirl marks have accidentally been introduced (note that this only applies to solid colour or laminated vinyl – uncoated printed vinyl cannot be polished, because the print could be inadvertently removed). The use of fine-cut polishes and polishing pads at low machine speeds and pressures will be necessary, as too much heat could lead to damage. Also the use of coarse, ‘heavy-cut’ compounds will mar the soft finish.

In the case of vinyl roofs, swirl marks will be less of an issue, but the fabric is likely to be textured and flexible, making it extremely difficult to repair. Machine polishing will not be possible, and patching or gluing/sewing a cut or tear may be the only remedy (and the repair may be highly noticeable afterwards).

CHAPTER FIVE

WHEELS AND TYRES

THE KNOWLEDGE

Wheels and tyres are in close proximity to each other, but they require drastically different cleaning, enhancement and protection techniques.

Like the windows of a car, clean wheels have far more of an effect on the overall finish than you might assume. If the wheels look clean, the car does too. So all the more reason to ensure that they are clean, polished and protected.

However, getting and keeping them clean isn't easy. Wheels and tyres suffer somewhat at the hands of their function. By their very nature they undergo extremes of heat and force, and get coated in the worst substances imaginable – and this situation is complicated by the fact that although wheels and tyres are made from completely different substances, owing to their proximity, products used in the cleaning process may accidentally transfer from one to the other. This proximity should be considered when leaving aggressive cleaning products to dwell on wheels, or when applying dressings to tyre sidewalls. Extreme care should be taken here to ensure that there are no adverse effects, either in the short or the long term, in terms of cosmetic damage or structural safety. It may therefore be worth making a cardboard shield or template to prevent wheel products being sprayed on to tyres, or vice versa. And only treat one wheel at a time if you are not sure of the results. It is better to use aggressive products on an inconspicuous area of a wheel, or one wheel only, than to treat the whole set and then find that the finish has been diminished afterwards.

SURFACE TYPES

It would be highly convenient for detailers if OEM and aftermarket manufacturers made wheels from a single material and finished it in a single way; at least tyres are relatively uncomplicated in comparison and show less variation. Because wheels can be dealt with so differently, it is important to ascertain what type they are before they are cleaned and protected.

PAINTED WHEELS (INCLUDING CLEARCOATED WHEELS)

Since the advent of steel wheels on cars, the most common form of corrosion protection has been by the application of a wet paint coating system. Like bodywork paint, the types of paint used can vary, although the application of multiple coating layers for corrosion protection and surface finish is likely. Owing to the environment in which the wheels have to operate, a solvent-based coating is common. Factory-finished or professionally recoated wetpainted wheels tend to have a clear surface layer applied – known as clearcoat – to improve the look and longevity of the coloured finish (just as with modern paint finishes applied to bodywork).

POWDERCOATED WHEELS

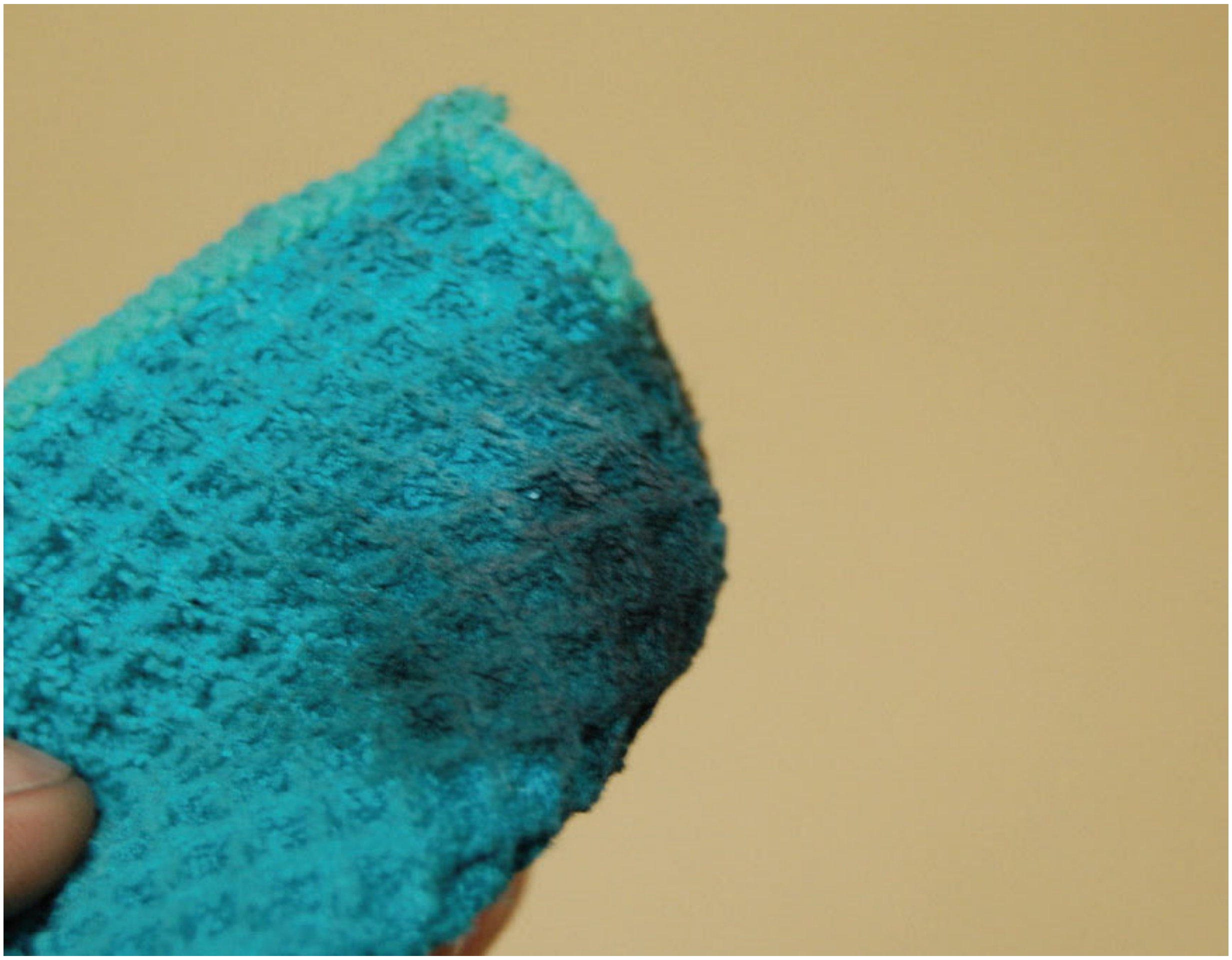
Small powdercoating machines allow the hobbyist to treat small components at home; for larger components, professional powdercoating services should be engaged.

Powdercoating has become a popular choice of corrosion-resistant coating for wheels due to the hard surface formed during curing. This has benefits over wet paint coatings, but also some downsides to be considered later. The application process involves earthing the metal wheel, then spraying it with a fine powder through a spray gun that applies a positive charge to the powder. This ensures that the dry powder adheres to the whole wheel surface during the next stages for maximum coverage, and also attracts discharged powder to the surface to be coated, reducing wastage (waste paint powder will not bond and can be collected/reused).The powdercoated wheel is then placed in a curing oven at a high temperature until the powder melts to form a skin over the surface. After removal from the curing oven, the powder cools to form a hard coating.

Because the coating forms a skin, it is durable in itself, but suffers from relatively poor adhesion. This, coupled with the general level of hardness, may mean that the surface chips quite easily; then, due to a low adherence to the surface, water may get underneath the coating and cause delamination (where the coating peels off in flakes).

Powdercoated wheels also tend to have a duller finish compared to wet-painted colour coats; this, combined with its relative brittleness, means that it is common for many powdercoated wheels to have a wet-painted clearcoat applied over the top (in which case your wheel has a wet-painted surface, in detailing terms).

BARE METAL/METAL-POLISHED FINISHES



Uncoated metal surfaces will turn a cloth black with polishing residue when a metal polish is applied.

Many high performance and ‘show’ wheels have an uncoated metal lip/rim, either as part of a threepiece ‘split-rim’ wheel, a cut and polished section of the original alloy wheel, or as an applied metaltrim piece bonded to the outer rim. The easiest way to test if your wheels are uncoated metal is to find an inconspicuous area, perhaps on the inside of the wheel, and rub some metal polish on to the clean rim/wheel with a soft cloth. If the cloth darkens, it is likely to be oxidized metal particles being removed on to the cloth, in which case the wheel/rim is left uncoated. If the cloth doesn’t blacken, it may be a clearcoated silver-coloured paint finish, or the metal may be clearcoated.

Note that whilst most metal encountered will be aluminium alloy, and occasionally chrome plate or steel, you may find magnesium used for some older custom wheels or modern racing wheels. This is a light material but more reactive and therefore prone to corrosion (and to becoming porous), so it should always be sealed or painted and never left bare.

ANODIZED ALUMINIUM FINISHES

Aluminium can be hardened and coloured in a process of electrolytic oxidation and dyeing, known as anodizing. If aluminium is brightly coloured or looks matt in finish, it is likely to be anodized. Whilst anodizing can make aluminium more durable, the dye itself is only a relatively thin coating in the uppermost oxidized layer of the aluminium, and can be inadvertently polished off, or otherwise removed. It can also be discoloured with strong chemicals. Therefore take care when cleaning and protecting anodized finishes.

TYRES

Modern tyres are a mix of synthetic and natural rubber compounds. They are also more durable than may be expected, resisting UV degradation, petrol spilled on fuel filling-station forecourts, and extremes of heat and cold. However, tyre rubber still has a relatively short lifespan compared to most other vehicle components, and from a functionality point of view, provides one of the key safety and operational roles. It’s important to ensure that anything applied to the wheels or tyres does not damage the tyre compound, prematurely shorten the tyre’s life, or impede its function.

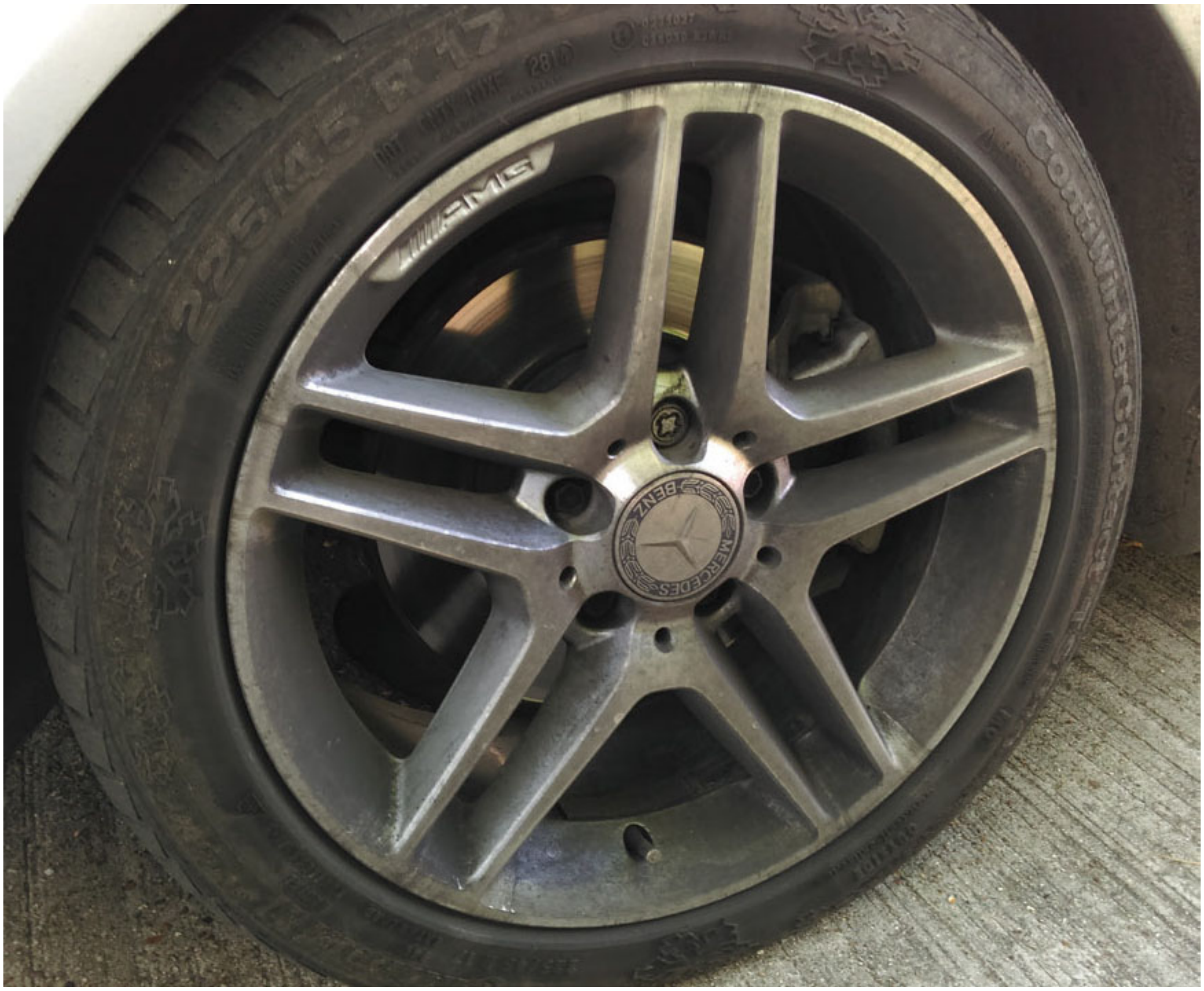
CONTAMINATION TYPES

The wheel well is one of the harshest environments on your vehicle. It is subjected to heat from the engine, brakes and tyres; hot particulate deposits and corrosive vapours from brake pads and discs; plus an abrasive maelstrom of stones, mud, grit and salt that collide with a wheel rotating at many times a second. It’s no wonder that wheels and tyres get so dirty, and need all the cleaning and protection that they can get.

MUD AND DIRT (GRANULAR DEPOSITS)

Roads are not clean, and the debris on them will be flicked up by a rotating wheel to coat the wheel, tyre and wheel well. This will be a combination of general dirt and grime, peppered with sand, stones and other hard granular deposits. It presents a high scratching/marring risk so needs to be removed without undue contact.

BRAKE DEBRIS



Brake dust can be acidic, adhesive and hard in composition terms, making it difficult to remove.

Brake discs are metallic, and brake pads tend to be carbon-metallic – when they make contact, the friction generated is immense, capable of slowing a vehicle weighing a tonne (or more) from high speeds to a standstill. This creates a lot of heat, and a lot of gas and debris, as the friction erodes both pad and disc. The hot gases generated can be highly corrosive and the resultant debris is very fine – this is the dark grey dust that sticks to wheels. In contamination terms, the 'perfect storm' is at work: hot, corrosive gases may combine with water to result in mildly acidic residues; adhesive binders used to form brake pads make the debris mildly adhesive; the paint or clearcoat covering the wheel may have expanded because of the heat from brake temperatures and tyre friction, causing microscopic pores to open in the softened paint/clearcoat surface; plus the brake dust particles themselves are very fine, very hard and very sharp – and therefore capable of embedding into any softer surface they come across.

Brake debris tends to gather in the nooks of wheel blades, and it can be very difficult to remove, especially if it is allowed to build up – the corrosive nature of brake dust means that it can even etch into the wheel's surface if left on an unprotected surface for any length of time.

TAR SPOTS

The lower half of a vehicle is susceptible to tar spotting, especially in the summer months when asphalt softens. The wheels are no exception, and indeed, they are the cause of tar being picked up from the road and deposited on to the car. The inner and outer wheel rims are common areas to find these tar flecks, as the vortices created by the revolving wheel fling the tar droplets around the wheel well and on to the fast-rotating wheel rim.

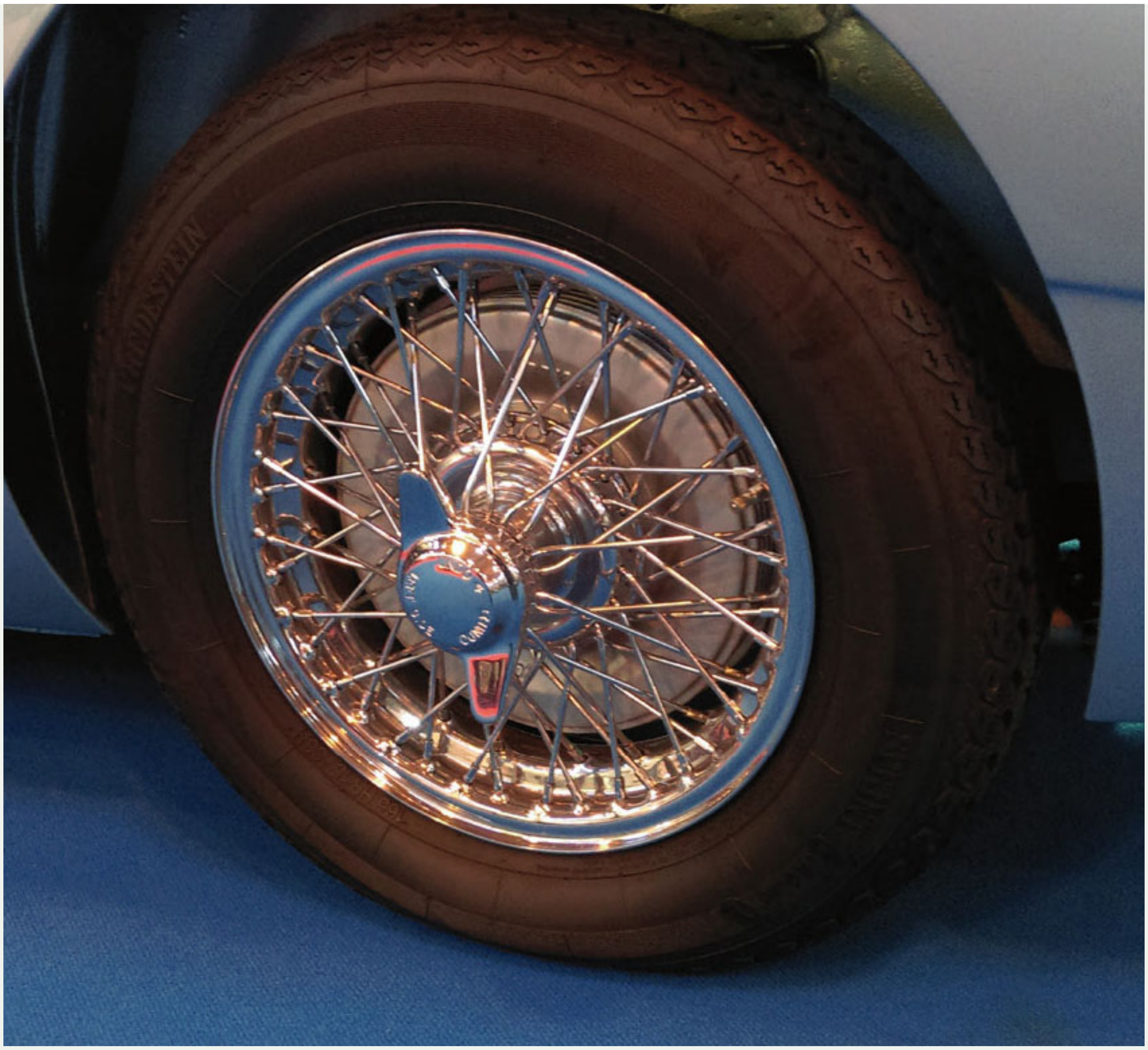
ADHESIVE RESIDUES

Bearing in mind the harshness of the operating environment, the pads used to stick wheel-balancing weights to wheel rims need a strong and durable adhesive. This has the unintentional side effect that when new tyres are fitted, or the wheels rebalanced, the fitter normally removes the old weights but not all of the old adhesive pad – and some of the pad, or at least its residue, remains on the rim, collecting dirt and looking unsightly. Other adhesive residues from paper and vinyl stickers may also be found on wheels, although these are not as common as wheelweight residues. They can be removed with the same techniques.

DEFECT/IMPERFECTION TYPES

Wheels will be prone to their fair share of scratches, chips, pitting, fading and etching – yet defects will be less visible because wheels rarely present a perfectly flat surface to onlookers, compared to, say, a bonnet or a door. They also avoid UV oxidation to a large degree because they are a vertical, rather than a horizontal surface – but the harsh conditions and aggressive cleaning regimes they experience may go some way to offset the aforementioned advantages.

SPEAKING OF SPOKES: THE ISSUE OF CONTAMINATION AND WIRE WHEELS



Wire wheels are time-consuming to clean, so ensure that they are protected with a wheel sealant to minimize the cleaning effort required.

Wire wheels are arguably the most complicated wheel type to keep clean and free of contamination, given their intricacy. It is therefore critical to clean them regularly, and to protect them with a wheel sealant – spray sealants will be easier to apply, but liquid nano-ceramic sealants will last the longest if applied carefully and with complete coverage. Plastic-collared brushes are classic maintenance tools, but microfibre gloves may also prove useful, allowing fingers to extend between the spokes; microfibre rope also exists, and this could help to 'floss' the wheels clean.

If the spokes have become rusty or lost their finish, any treatment may only have a temporary benefit, so the wire wheels should be disassembled and the spokes replaced, repaired or re-chromed. This task is time-consuming and frequently expensive, so should only be undertaken as a last resort.

SCRATCHING/MARRING TO PAINTED/POWDERCOATED FINISHES

Given the proliferation of grit in the wheel-well area, it is little wonder that paint – including clearcoat – and powdercoat can become scratched. Grit tends to be far harder than these coatings, with sand often containing a large silica content (silica, or quartz, being one of the hardest substances on earth). This means that any contact, whether in the form of impact or friction, could result in marring. Finally, note that the constant bombardment of particulates against the wheel surface ultimately results in pitting and other forms of microscopic surface damage, allowing contamination to stick more readily and making its removal more difficult.

STONE CHIPS TO PAINTED/POWDERCOATED FINISHES

Stone chips, particularly in powdercoated wheels, are often the start of more significant damage because they allow water/chemical ingress, which can lift the surrounding area of the coating. Once breached, a coating is attacked from all sides, rather than just the uppermost surface, and it will be in danger of becoming detached from the substrate as its adhesive capabilities are compromised. Once detached, the coating cannot be re-stuck and has ‘failed’: the exercise is then simply one of ‘damage limitation’, where attempts are made to prevent the clearcoat lifting further. Ultimately, a respray will be necessary.

SCRATCHING/MARRING TO METAL FINISHES

Despite being harder than paint, metal can still be scratched or marked, and this has a number of effects. Firstly, micro-fine scratches and marring increase the surface area available for contamination to adhere to, allowing wheels to become dirtier, more quickly. Secondly, scratches and marring are unsightly, spoiling the look of the wheel, particularly if it is polished. Finally, cleaning the wheel is made more difficult: contaminants bond better to rough surfaces, and scratched wheels resist cleaning techniques more than if they are smooth (by being unscratched).

CONTAMINATION REMOVAL

As we’ve already learned, the aggressive removal of contamination from a vehicle’s painted surface should be reduced as much as possible, to minimize the long-term damage to the surface being cleaned. It’s easy to fall into the trap of wanting to clean the wheels rigorously at each maintenance wash, because they get heavily soiled, very quickly. However, as with other surfaces, it is much better to decontaminate them fully less frequently, and rely on a gentler maintenance regime, after the wheels have been adequately sealed/protected.

Also worth mentioning here is that any product designed to remove brake dust from your wheels is going to have a detrimental effect on the brake pads and even brake disks, so application should always be sparing and directed at the area being cleaned (to avoid overspray). Repeated application of a weaker or diluted product will always be preferable to a single application of a more aggressive product, or a product at full strength. Ultimately the cleaning effect will be the same, but the chance of inadvertent damage will be much smaller.

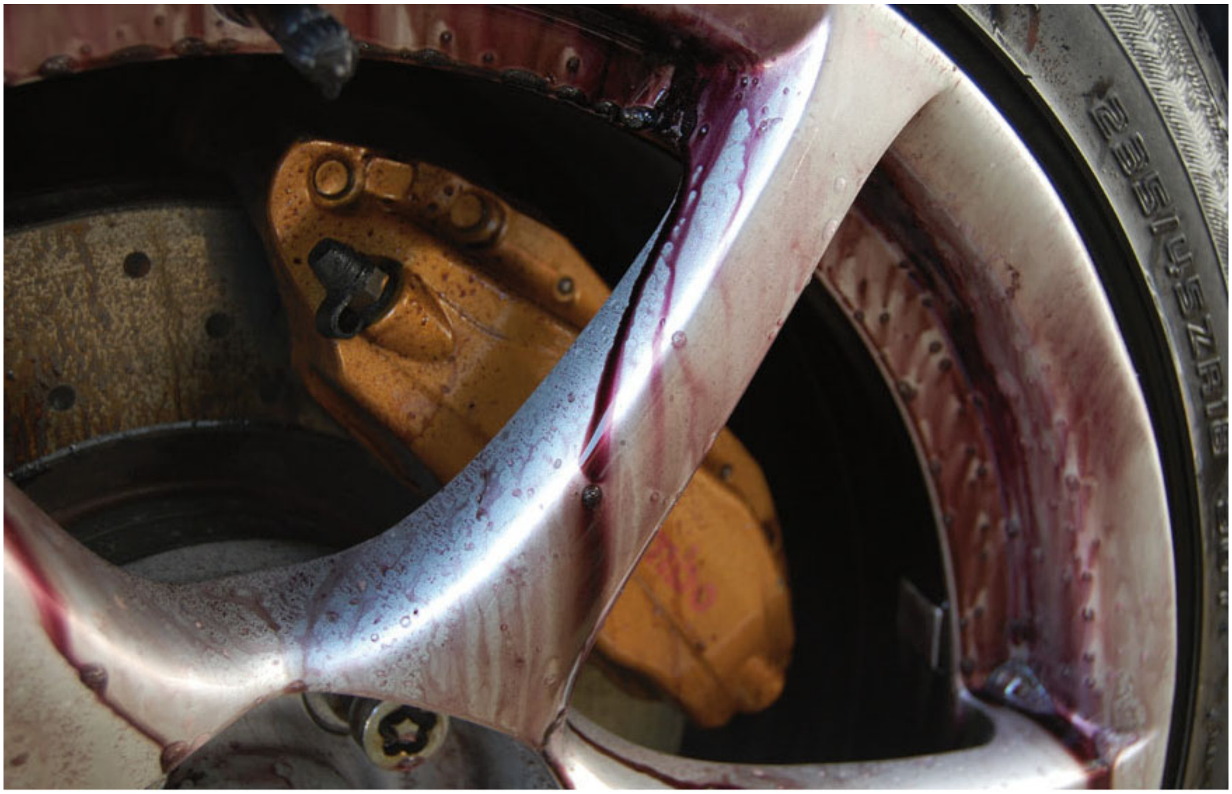
WHEEL-CARE PRODUCTS

Some of the most aggressive cleaning products available to detailers are those that target the wheels. However, restraint should be exercised where possible as prolonged use of strong chemicals can remove temporary coatings (sealants and waxes) and may also attack the original finish. Gentler products are recommended for regular wheel care, with more purposeful products reserved for heavier cleaning tasks.

AGGRESSIVE WHEEL CLEANERS

Many of the dedicated wheel cleaners on the market contain strong acidic or alkaline solutions designed to remove stubborn contaminants. Whilst their effects can be metered by pre-wetting the wheels or only allowing a short dwell time, they are aggressive and should be used in moderation. Note that many ‘acid-free’ products are actually highly caustic, rather than being pH-neutral, and could cause just as much damage to sensitive finishes or components as an acidic product.

MILD/PH-NEUTRAL WHEEL CLEANERS



Thioglycolate wheel cleaners show a purple colour change when their active ingredients react with ferrous deposits (for example, brake dust).

Wheel cleaners labelled as pH-neutral or ‘mild’ may still contain strong chemical cleaning agents, although it is assumed that in most cases they will be gentler in action and therefore suitable for ‘custom’ alloy wheels that have sensitive finishes (for example chromed, anodized or bare metal). The most aggressive (and therefore effective) pH-neutral wheel cleaners are likely to be the ‘thioglycolate’ iron removers, often used for fallout removal at the decontamination stage: these display a purple indicator colour when iron debris from brake pads or discs is encountered. They smell relatively unpleasant in use but are extremely effective, especially when blended with other cleaning agents – and the purple indicator shows the amount of underlying contamination, plus a visual demonstration of the performance of the product.

Note that despite being largely neutral in pH terms, these products may exhibit a mild exothermic reaction when iron particles are encountered on the coating or wheel surface, and sensitive or damaged finishes may still be affected; however, they do tend to be safer to use on a wider variety of wheels than traditional acidic or caustic cleaning products.

Other pH-neutral wheel cleaners include those based on strong surfactants or detergents (in effect, strong car shampoos, perhaps with a solvent element) and those containing neutralized acid salts. Some may contain both. Due to the variety of possible formulations, it is essential to test a chosen product on an inconspicuous area of the wheel first (such as the inner rim or other part inside the wheel, rather than on the outer rim) if you have identified that your wheel requires more care during cleaning. It is also better to clean the wheel many times with a weaker product or technique than to risk damage by using a more aggressive process in one ‘hit’. Shorter dwell times and thorough rinsing will all contribute to the safety of your wheel-cleaning process.

TAR REMOVERS

Most tar removers are sprays, capable of covering large areas quickly; however, small tar spots can be removed in isolation with a paste tar remover (shown here), without compromising the surrounding area (tar removers will tend to affect wax and sealants on the wheels and paintwork).

Tar is extremely prevalent on wheels, and whilst it can be removed using clay bars or polishes, it is easier, more effective and safer (in paint terms) to use dedicated tar removers. These will be solvents or degreasers in product terms, ranging from highly aggressive xylene solutions, to relatively pleasant orange-oil ‘limonene’ cleaners. Note that these will also be effective at removing wheel-weight residues, but remember that helpful products may become a hindrance if inadequate care is taken during their use – if left to soak into the base of ‘good’ wheel weights in current use, they may weaken the bond and cause them to fall off the wheel rim. Overspray of tar removers in the wheel and wheelwell area may also lead to the removal of grease from wheel, steering and suspension components. Some degreasing agents capable of removing tar, such as WD-40, may also contain lubricants, and overspray on to brake pads and discs could be potentially fatal.

WHEEL SEALANTS

In theory, any wax or sealant used for the car's bodywork could also be used for the wheels. But wheels operate in harsher environments, being subjected on a daily basis to high brake temperatures and brake debris, and in winter to grit and salt. Manufacturers have therefore developed specific products that offer increased protection and endurance, often at the expense of the ultimate visual finish – in other words, because wheels have fewer flat reflective surfaces than body panels, and are rarely machine polished, then thicker coatings that may cause patchiness, hologramming or strange optical effects on regular paintwork could be used – onlookers would simply never notice any differences in reflectivity.

Wheel waxes and sealants will operate in a similar way to bodywork products, doing one, some, or all of the following:

- Creating a sacrificial barrier that absorbs contamination, preventing it from attaching directly to the wheel surface and therefore being unable to attack it through contact
- Presenting a repellent or slippery surface to contaminants so that they cannot bond so easily, keeping the wheel cleaner for longer and making it easier to clean
- Covering the wheel in a harder coating that may resist scratching from contaminants and also prevent degradation of the underlying wheel surface
- Showing resistance to the high brake temperatures that may exist in the wheel area, to prevent premature failure of the coating

When choosing a wheel wax or sealant, try to establish what characteristics are important to you, and then pick a product that seems to offer what you need. Note that show cars may require very little additional protection, and highly polished rims may be susceptible to strange optical effects (such as 'rainbowing') if thick coatings are employed, meaning that the most durable wheel products may be unsuitable. The table opposite may help in your decision.

TYRE DRESSINGS AND SEALANTS

Whilst tyres rarely have specific cleaning products (APCs, degreasers and shampoos adequately fulfil these needs), bespoke dressings and sealants are available to keep tyres looking their best – and protected as far as possible. Dressings are usually silicone based, which may make tyres look clean and shiny but often leaves them sticky to the touch – and the product could even 'sling' off the tyre as it rotates. These dressings offer little protection. If a more enduring product is required, capable of protecting the (already durable) tyre, and perhaps offering more resistance to contamination, then waxes and sealants are available.

Waxes are often thick black pastes that help recolour 'browning' rubber, whereas sealants tend to be clear liquids that coat the rough rubber surface with a slicker (and sometimes harder) outer layer. All must be flexible and safe to rubber, so ensure that only tyre-specific products are used. Note that cleaners, dressings and paints for whitewall tyres are also available, but these types of tyre are specialist and rare, so the products used on them will not be covered in great detail.

WHEEL-CARE EQUIPMENT

Brushes are typically chosen to maintain wheels and tyres: they can remove granular dirt quickly, they allow cleaning of poorly accessible areas of the wheel, they can be cleaned relatively easily, and they also typically withstand the aggressive contamination and cleaning products encountered during the wheelcleaning process. However, they can be harsh on soft finishes, potentially causing marring, and they may flick when in use. This means that soft cloths, sponges and mitts should also be considered when detailing wheels, and harsher devices such as scourers and wire wool avoided, unless a wheel needs to be completely restored. But remember, the lack of reflective surfaces means that your finest and softest microfibres may never need to be used, because marring will be less noticeable than on bodywork. So 'bodywork' microfibres that are past their prime are ideally employed for cleaning wheels or underbody areas ('B-grade' work: once microfibres have been used for 'dirty' tasks, they should be consigned to 'B-grade' duties only, and should never touch 'A-grade' areas, such as paintwork, again).

Important Characteristics of Wheel Waxes and Sealants

Product type	**Temperature resistance**	**Contamination repellence**	**Ease of cleaning**	**Scratch resistance**	**Endurance / longevity**	**Optical side effects**
Carnauba wax	Poor	Medium	Medium	Poor	Poor	None
Hybrid carnauba wax/sealant	Good	Medium	Good	Poor	Medium	None
Polymer sealant	Good	Very good	Good	Poor	Good	None
Resin sealant	Good	Very good	Good	Good	Very good	Possible
Nano-ceramic sealant	Very good	Medium	Good	Very good	Very good	Possible

WHEEL BRUSHES

The plastic collar on this wheel brush protects the finish of the wheel if accidental contact occurs.

Brushes come in many different designs, and the type that works best for you will largely depend on the shape and surface type of your wheel. The bristles/contact medium should be stiff enough to remove the contamination, but not so stiff as to damage the wheel or wheel coating; both synthetic and natural variants will be available. In all cases, the bristles or material of the brush will be attached to its handle, and this needs to be adequately soft, or protected from coming into contact with the wheel surface, to avoid potential damage during use. Spiral wiretype brushes with a metal core need to be checked particularly carefully: a plastic or rubber tip to cap the metal core is essential, and collared brushes should have a plastic collar (ferrule) as metal collars will corrode, and they could also damage the wheel surface in use, if accidental contact is made.

Finally, don't be afraid to cut down bristles on wheel brushes to make them stiffer, if it makes the brush more effective in use; a soft-bristled but stiff brush is often the ultimate specification for wheel-cleaning purposes. Use (old) toothbrushes and detailing swabs for hard-to-reach areas, while domestic fingernail brushes or dishwashing brushes may prove effective on tyres – however, they will invariably be too harsh if used on the wheels themselves.

WHEEL SPONGES AND MITTS

Thin microfibre wheel mitts are excellent at cleaning behind wheel spokes; they will be far more effective than brushes at this task.

Lug tools are available to clean wheel nuts, wheel bolts and the lug hole. A brush or microfibre cloth could also be used.

Dedicated wheel mitts and sponges are normally of a smaller size and slightly coarser texture than those for bodywork, to allow for working in and around the intricate areas of a wheel, and to help remove the increased amount of bonded contamination. Mitts are supremely effective with spoked wheels where you can fit your hand around and behind the spokes – the back surface of the spokes can be cleaned far more easily with a mitt than with a brush. Go for a mitt with a short pile and of thinner material – fat mitts with deep pile will not be as efficient for this task, and risk making contact with the ground; some detailers even use thin microfibre gloves, because the fingers allow delicate cleaning of confined areas.

Sponges may tear on wheel nuts, split-rim bolts or sharp edges to lug wells, but otherwise they can hold a lot of water and may prove effective. Some small tools are even made to hold a foam head to get inside lug wells and clean around wheel nuts and bolts.

MAINTENANCE REGIME

It is always advisable to pre-rinse the wheels before washing, to remove any loose material and allow the cleaning products to make better contact with any stubborn contaminants. Be careful when using a pressure washer, because if the jet hits gravelly ground, the kickback could cause stones or dirt to be flung up against the wheels or bodywork. A pH-neutral snow foam could also be used if the contamination is heavier than usual, or the cleaning interval longer than normal. Some may feel that cleaning products work better ‘dry’ than on wet wheels because they will not then be diluted, but the reality is that loose debris may shield underlying contaminants, and this could limit cleaning more. Wetting the wheels also ensures that they are cool, since applying strong chemicals to a hot surface could increase the chances of damage to a sensitive finish – but never apply water to wheels and brakes if they are red hot, as the sudden decrease in temperature could cause components to crack.

PAINTED/POWDERCOATED WHEELS

If the wheels are sealed (*see* below), regular maintenance washing using a warm shampoo solution should be sufficient to remove accumulated brake debris, dirt and grime. Use a twin-bucket wash method (with fresh rinse water, if required) to minimize marring, and whatever combination of brushes and mitts is necessary to loosen and remove the contamination.

Ensure that the surface being washed is always well lubricated with wash solution, then rinse the wheel thoroughly afterwards with cold water. If spot contamination (for example, tar) remains, then remove it with a gentle cleaning product such as a detailing spray (to preserve the protection already on the wheel), or remove the wheel centre caps and proceed to more intensive cleaning techniques, then reapply wax or sealant to the relevant area afterwards.

If the wheels are unsealed, the maintenance methods given here may be inadequate to get the wheels clean, and more aggressive decontamination techniques (for instance claying or the use of strong chemicals) may be required. However, it is always worth trying gentler processes and products first.

BARE METAL WHEELS AND SENSITIVE FINISHES

Pre-wash bare metal wheels and sensitive finishes with water or a pH-neutral snow foam, then wash with a shampoo solution using the twin-bucket method. For heavier contamination use a pH-neutral wheel cleaner. Soft brushes, mitts and cloths should be used. If the wheels are unsealed, use a solvent on any tar spots that remain; if a wax or sealant is present, attempt to remove tar spots with a quick detailing spray to preserve the protection product.

TYRES

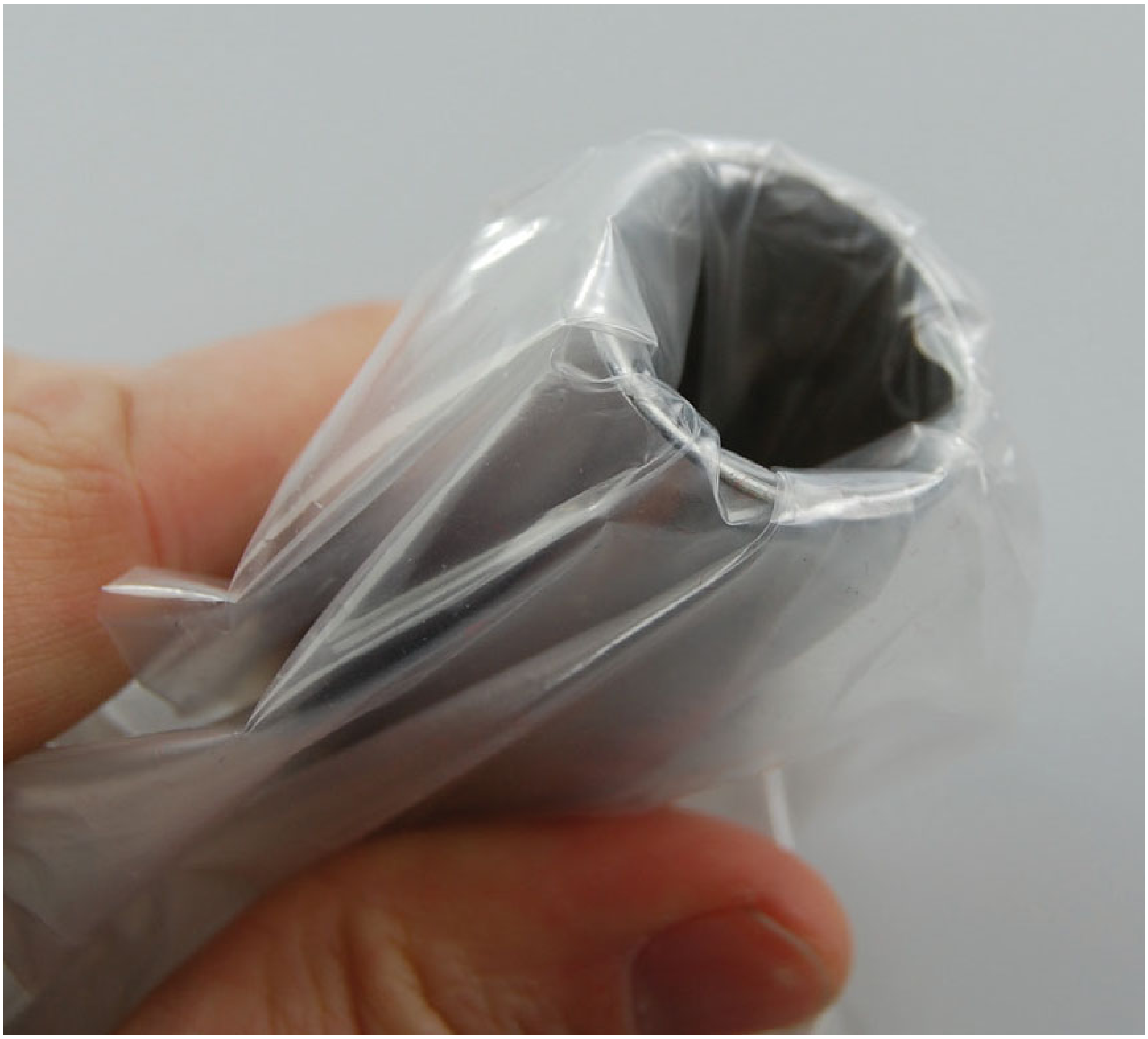
Tyre surfaces are quite 'rough' in material terms – rubber is rougher to the touch than paint, plastic or metal – and their mouldings also tend to feature ribbing and other patterns/textures. This can accelerate contamination and inhibit cleaning.

Use a microfibre mitt or stiff brush to clean the tyres; sponges may grab and tear against the rough rubber texture, and hairs may be removed from woollen wash mitts. A shampoo solution will be adequate to clean all but the most heavily soiled tyres. A twin-bucket technique is recommended, but is not essential (unless the rest of the wheel is being cleaned at the same time). It is assumed that tyres will always be re-dressed and are rarely protected, so an APC could be used if more cleaning power is needed. Work along the ribs and grooves of sidewall mouldings as these can harbour dirt that may only be visible after the tyre has dried.

DECONTAMINATION

If sealants are being applied, or the wheels are particularly contaminated, a full decontamination process should be carried out. This will remove all previous waxes or sealants, plus a full range of contaminants – though care must be taken not to damage sensitive wheel finishes.

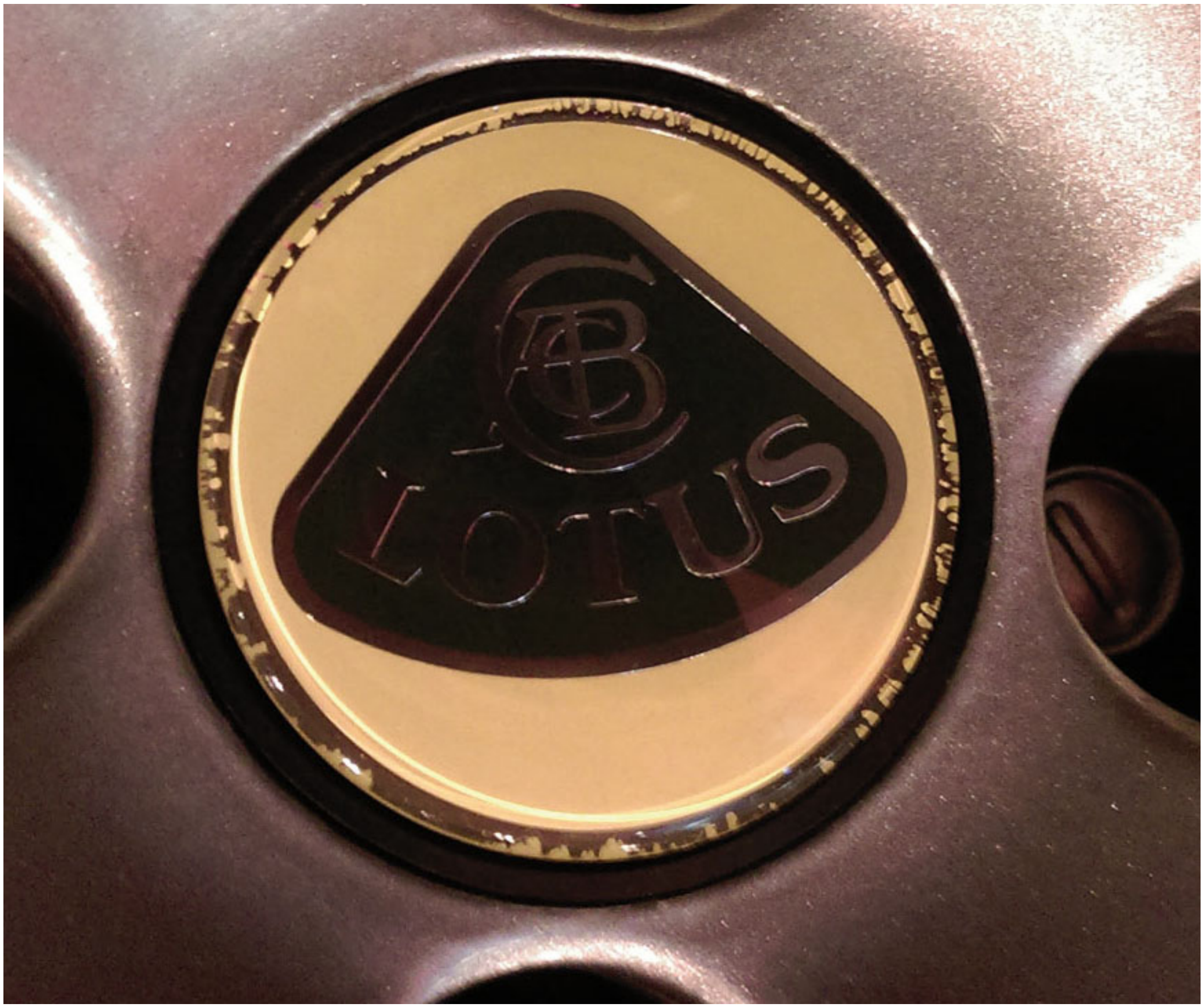
PAINTED/POWDERCOATED WHEELS



Use a plastic sandwich bag over the wheel nut to prevent marking or scratching it during removal. Afterwards, lay the wheel on a plastic mat during cleaning, never on the ground.

Firstly, remove the centre cap to prevent any damage caused by aggressive chemicals during decontamination. You may also need to consider removing the wheels in order to clean the inner surfaces, although this can compromise safety so should not be undertaken lightly. If cleaning the wheels off the vehicle, undo the wheel nuts carefully using a freezer bag in between the socket and nut to prevent scratching, then lay the wheel on a rubber mat to prevent damage (note that if grease is removed during decontamination you may need to regrease the hub surface with copper grease when the wheel is put back on the vehicle).

Next, rinse off loose debris using a pressure washer, then apply a suitable wheel-cleaning product to the wheels, being mindful to keep overspray to a minimum – aim *at* the spokes rather than through them, and use a wider spray pattern if the bottle nozzle adjusts. Acidic wheel cleaners and ‘non-acidic’ caustic cleaners will be amongst the strongest available, so use these with caution – shorter dwell times will be required on darker finishes, and you will need to rinse thoroughly after use. pH-neutral wheel cleaners, such as thioglycolate-based fallout removers, citrus/solvent cleaners and strong detergents, will be gentler alternatives.



This centre cap is showing mild corrosion caused by the action of stronger cleaning products: always remove centre caps during wheel cleaning, if possible.

After application of the wheel-cleaning product, rinse with water fastidiously, paying particular attention to the areas around the tyre valves, wheel nuts and centre cap area, and then apply neat tar and glue remover to any tar spots that are found. Rinse once more to eliminate traces of solvent, and then clay the wheel with a fine- to medium-grade clay and suitable clay lubricant.

If the clay starts to ‘melt’ this is because some solvent has remained, so wash the wheel with a shampoo solution and re-rinse. All embedded contaminants should now have been successfully removed; to check, apply a colour change fallout/iron remover to the wheel, and look for any reactions. Rinse the wheel for a final time, and then dry.

WASHING WHEELS: BEFORE OR AFTER THE MAIN WASH?

Detailers will often tackle wheels first, before they embark on the main wash of the car's bodywork. However, this will surely make the mitt and wash water hugely dirty? So should you simply clean the wheels last, when the bodywork has been done? The answer has two strands. Firstly, in the initial stage detailers are often only applying a long-dwelling wheel cleaner, rather than cleaning the wheel as a whole at this point; these cleaning sprays won't sully wash water and are applied early on in the wash process because this gives them a longer time to act. Secondly, detailers will invariably use a separate mitt, and maybe even a separate bucket (or buckets) to wash wheels – this makes contamination of bodywork wash water far less likely. So the recommendation is a relatively simple one. If a long-dwell wheel cleaner is to be used, by all means apply this after having rinsed the wheels at the pre-wash stage (mindful that strong cleaners may attack sensitive finishes, and should not be allowed to dry out), but otherwise leave washing the wheels until last, especially if only using a single bucket and the same sponge or mitt.

BARE METAL WHEELS AND SENSITIVE FINISHES

For bare metal wheels and sensitive finishes, again remove the centre cap and rinse the wheel with clean water, using a pH-neutral snow foam as an additional pre-wash stage, if required. Next, choose a principal wheel-cleaning product suitable for the finish (pH-neutral wheel cleaners are often favoured; avoid using strong chemical cleaners). Agitate with a soft brush, sponge or mitt, then rinse with cold water after the application is complete.

Next, check for tar spots and apply a solvent tar and glue remover. Afterwards, rinse with cold water and consider the use of a clay bar and lubricant – but only use clays on bare metal wheels or those with robust finishes: do not use these on anodized finishes. You may also be able to use a thioglycolate fallout/iron remover on many finishes, but check on an inconspicuous area first if you are not sure. Finally, rinse the wheel and dry it.

TYRES

Even though tyres get extremely dirty, they rarely need the same level of decontamination as the wheels. This is partly to save them being continually assaulted with harsh chemicals, but also because their dark colouring hides dirt more easily. Rubber has a rough surface texture, preventing it from being clayed, so after a rinse and pre-wash with snow foam, the only additional measures may be application of a TFR, APC or degreaser. TFRs may be extremely aggressive, potentially discolouring the rubber, so a mild APC solution is recommended. Work it into the rubber with a short, stiff-bristled brush (being careful to avoid the wheel rims), and then rinse with cold water. Degreasers may attack the rubber in the tyre more than APCs due to their higher solvent content, so only use a degreasing agent if other methods have proved inadequate.

ENHANCEMENT AND PROTECTION

Waxing or sealing the wheels doesn't just improve their appearance and keep them protected, it makes them easier to maintain as contaminants find it harder to adhere to a slick, coated surface. Tyres are rarely protected, possibly due to the lack of protection products available, but they are frequently 'dressed' to make them look good. Tyres will generally need dressing every wash as they become soiled quite quickly, and some dressings may even attract dust and dirt.

PAINTED/POWDERCOATED WHEELS

With painted and powdercoated wheels, firstly decontaminate the wheel to ensure that all existing protection coatings have been removed. Then use a fine- to medium-grade polish to enhance the gloss of the wheel surface and reduce marring. If you want to maximize the finish and you are using a traditional wax or sealant, you can apply it straight over the polished/buffed surface. If, however, you wish to maximize the longevity of the coating, wipe the wheel with solvent before applying the protection product.

Note that 'hybrid' waxes should be used to protect wheels as they have a higher temperature resistance; natural carnauba waxes will struggle to contend with the heat from the brakes and could fail prematurely. Nano-ceramic sealants are a good option, and when applied to a solvent-wiped surface last a long time before wearing off; however, they are expensive and relatively difficult to apply, they may alter the finish if applied incorrectly or inconsistently, they are prone to water spotting and they fail to resist the build-up of daily contamination as well as traditional polymer sealants. Resin-based ceramic sealants are another long-lasting option, but again, they can be difficult to apply and can alter the wheel's finish – most noticeably with mirror-finished metal wheels (which may show a 'rainbowing' effect).

BARE METAL WHEELS AND SENSITIVE FINISHES

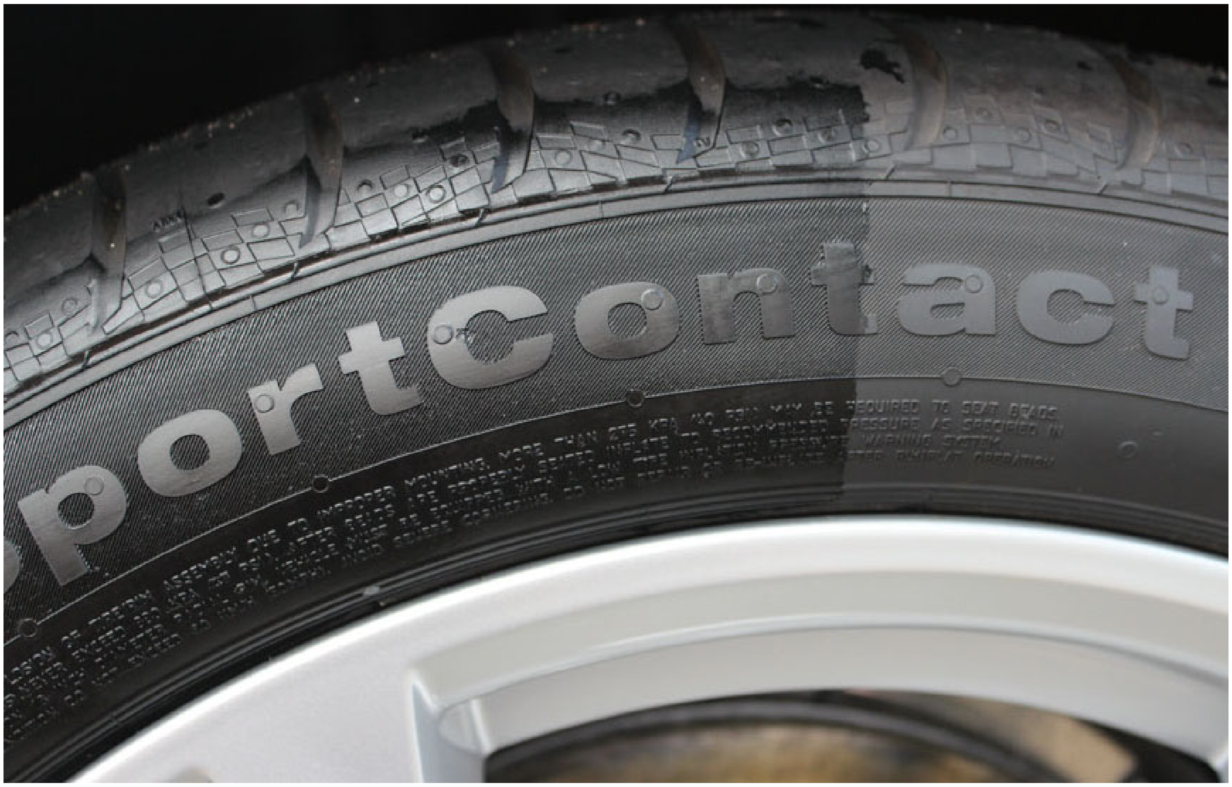
Bare metal wheels can be polished using traditional metal-polishing methods; usually a fine- or mediumgrade metal polish and a waffle-weave microfibre are all that is required to create a dazzling lustre. If the metal is too corroded, you will need to restore the finish using more aggressive techniques (*see* below). Never attempt to use metal polish on anodized metal wheels or clearcoated metal wheels, as the upper coating will simply be removed and need reapplying. Other types of sensitive finish may require mild enhancement only – the use of microfine paint polish or even just a water-based quick detailer could be the limit to safe and effective treatment.

In terms of protection, bare metal wheels are particularly frustrating to detailers and owners alike, because the highly polished finish previously achieved will invariably deteriorate over time, and there is little that can be done to prevent this natural degradation from occurring. Waxes protect well initially, but their honeycomb structure allows oxidation to occur after a couple of weeks. Sealants may fair better, but they find it difficult to bond to polished metal surfaces; these are often microscopically soaked in polishing oils from the metal-cutting process, and the dense structure of hard metals also creates a smooth and regular surface, both of which inhibit bonding.

The trick is to solvent-wipe the metal surface to eliminate the oils, then apply a hybrid wax or sealant. Nano-ceramic and resin-based ceramic sealants may yield the best results, but they may alter the finish of mirror-polished wheels. If the car is being entered into a ‘show and shine’ competition, or finish is of paramount importance, it may be safer to apply a traditional polymer sealant and accept that longevity/durability may be compromised.

Sensitive finishes will require milder protection products; a carnauba wax, hybrid wax or traditional sealant are the most judicious routes. These may not offer the highest ultimate performance, but they will be unlikely to compromise the finish.

TYRES



Dressed versus undressed sections of tyre: merely cleaning a tyre will fall short in finish terms.

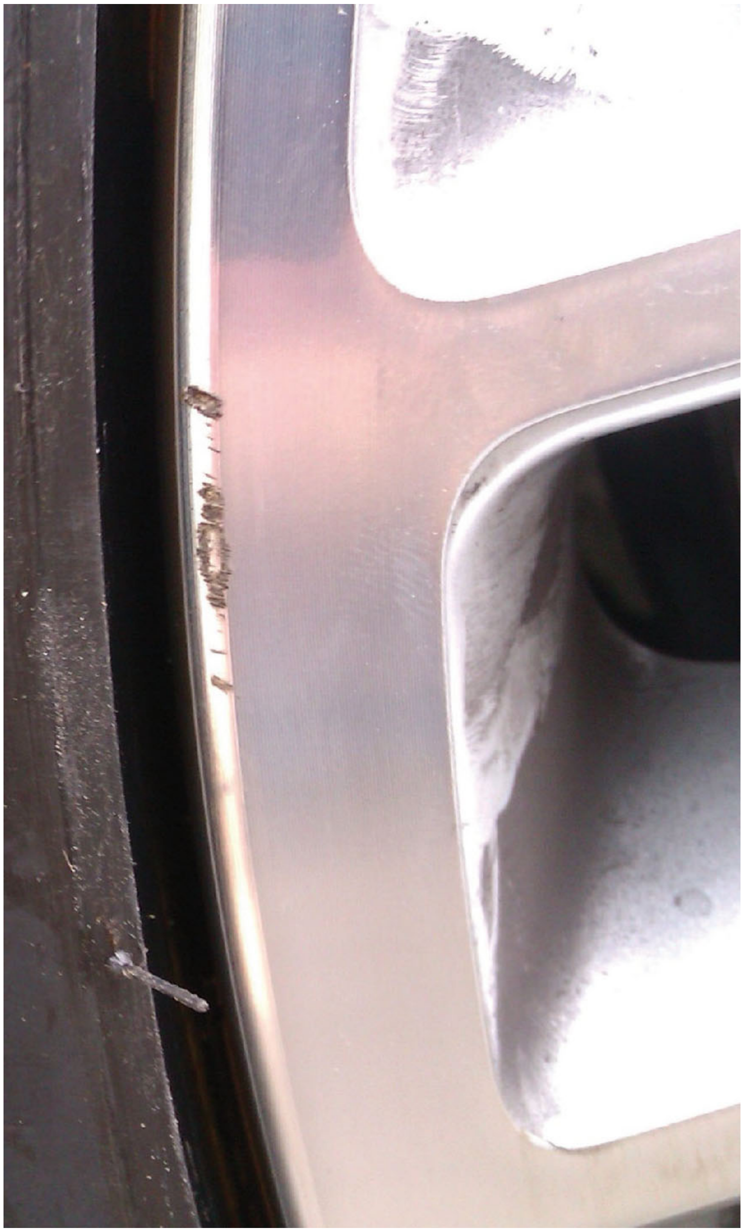
Tyre dressings and tyre protectant products usually provide multiple benefits: they restore or create a good tyre finish, they may attempt to lower contamination adherence and they could also offer additional protection to the tyre (although this is unlikely in most instances). Typically, these products are applied to a clean, dry tyre. There is no need to polish or solvent-wipe beforehand, and indeed these preparation steps would be unsuitable. Allow the tyre product to cure fully before moving the vehicle; some products can 'sling' when the wheel starts rotating.

Note that dressings rarely last as long as tyre waxes or sealants, and that all products may need to be applied every wash because wheels become contaminated so quickly and are relatively rough in surface terms (this makes them less able to resist daily contamination). You may also find that the glossiest 'wet look' dressings are prone to 'sling' and are quite sticky, and instead of repelling contamination, they may inadvertently attract it. As ever, try a variety of products and consult fellow detailers to find what may work for you. Avoid regular application of solvent-based dressings or sealants, however. Whilst water-based dressings can be applied frequently, solvent-based products may harden, discolour or even crack tyres over time, especially if the tyre is old.

SURFACE RESTORATION (DEFECT/IMPERFECTION RECTIFICATION)

Surface restoration includes the rectification of defects and imperfections. Damage to wheels should be checked professionally to ensure that the integrity of the wheel hasn't been compromised (for example, through buckling or because of missing wheel weights). However, light damage or cosmetic defects, such as 'kerb rash' (abrasions and scratches to the rim) and peeling paint surfaces can often be fixed relatively easily.

PAINTED/POWDERCOATED WHEELS



‘Kerb rash’ can be repaired or improved using amateur techniques, but the best results may be from professional wheel refurbishment.

With painted wheels, surface chips and scrapes can usually be repaired by recoating the front face or the whole surface of the wheel. This involves professional repair, flatting and respraying techniques if carried out by a wheel refurbishing company, although the amateur detailer may experience some success by merely polishing out the worst of the damage, using bodyshop filler to hide deeper defects, and then using a suitable paint system (a paint chip kit or spray can) to minimize the visual contrast compared to the original finish. Remember that wheels should generally be refurbished as a set, if possible, because a single wheel may stand out if repaired in isolation – finishes can be very difficult to match exactly.

Damage to powdercoated wheels cannot be fixed quite so easily – recoating rather than repair is technically preferable – although they can be touched up with paint if the finish does not need to be integrated perfectly.

BARE METAL WHEELS AND SENSITIVE FINISHES

Bare metal wheels can be polished using traditional metal polishing techniques to remove light scratches, scrapes and marring – but, once again, any alterations should be executed with care so as not to distort or damage the wheel as a whole. Sensitive finishes, on the other hand, may be very difficult to repair or restore. Anodized surfaces cannot be polished, but could potentially be re-anodized. Likewise, plated metals can be cautiously polished or replated, but few finishes are as easy to repair as those that are painted.

TYRES

Any nicks or lumps gouged from the tyre sidewall can affect the tyre's integrity, and you should seek professional advice as to whether the tyre needs to be replaced. Bulges to sidewalls and exposed canvas or metal braiding mean that the tyre cannot be fixed at all and should be immediately replaced, but small punctures in the main tread can sometimes be repaired by a tyre specialist if the tyre has not been driven on whilst severely deflated. In short, there is little that the amateur detailer can do to restore or repair tyres – although black tyre paints do exist if the rubber has faded but remains safe and serviceable (these paints are really, in effect, ultra-durable dressings). Rubber cannot be sanded and responds poorly to polishing – it simply needs to be maintained by being cleaned, dressed and (potentially) protected.

WHITEWALL TYRES: CLEANING, PROTECTION AND RESTORATION

Often only found on classic American cars, whitewall tyres can be treated in a similar way to regular tyres – the band is usually made from zinc oxide rubber rather than painted on.

Whilst often fitted to classic American cars, whitewall tyres are a rarity on modern vehicles in most of the world. Rather than being painted on, the white section is usually either white ‘zinc oxide’ rubber or a band of bonded white rubber, and can therefore be treated relatively robustly.

Cleaning techniques will be similar to those for normal tyres, although a strong whitewall detergent could be used with a stiff brush to get them as clean as possible (dedicated products are available, sometimes taking the form of aggressive bleaching and scouring powders). White rubber will, of course, become visibly soiled far more quickly than black rubber, so a thorough clean will be even more necessary. A strong APC or degreaser may work adequately well if a dedicated product cannot be easily sourced.

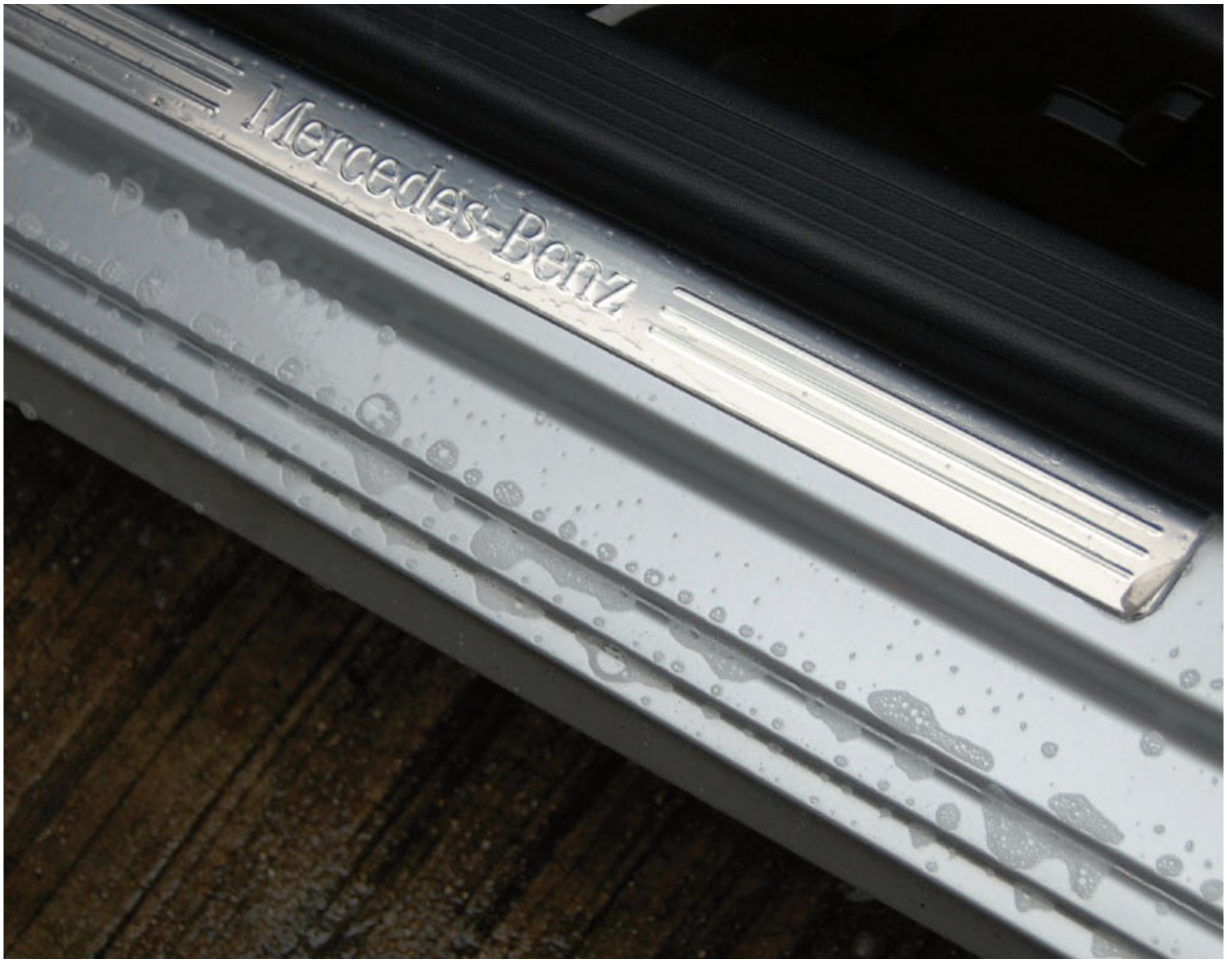
Enhancement and protection will take the form of regular tyre/rubber dressings, although blackcoloured products should (quite naturally) be avoided. Protection products for tyres also exist, prolonging the finish and helping the white sidewall to resist contamination. In terms of restoration and repair, minor scratches and scuffs can be improved with a mildly abrasive polish (the whitewall moulding is not integral to the construction of the tyre, so more aggressive techniques can be employed) and whitewall paint can be used to refinish the band if required. Note that more gentle cleaning techniques may need to be used after the whitewall is painted, to avoid inadvertent removal of the paint.

CHAPTER SIX

UNDERBODY AND ENGINE BAY

THE KNOWLEDGE

Areas of the car that can’t be seen are less scrupulously detailed, perhaps rightly, than more visible parts and panels. However, detailing at the highest level requires that even inaccessible and inconspicuous areas should be cleaned, polished and protected; this is part of the ‘detail’ that raises the completed task above a mere ‘valet’. A polished door sill or clean fuel-filler recess could indicate that the car has been subject to the intensive and expert attention of a true detailer, rather than just a ‘quick clean’ carried out by someone less committed.



Remember to wash the door sills – dirty door sills and jambs can spoil the overall look of a car, but they are easy to forget because they are hidden for much of the time.

The big question raised by the detailing of these areas is whether they should be detailed before, or after, the cleaner and more visible parts of the car. If cleaned afterwards, there is a chance that dirt could contaminate the previously detailed areas. If cleaned before, undue attention may be spent on less visible areas, perhaps curtailing time spent on the more critical aspects of car care. There is, of course, no definitive answer, just personal preference. From a technical perspective, the ideal stage to attend to the underbody, door (or panel) shuts and engine bay is after the pre-wash but before the main wash itself. This means that most of the dirt from the vehicle exterior will have been removed before panel shuts are tackled, thus preventing further contamination, yet any dirt and grime running from panel gaps or migrating from the engine bay will be removed shortly afterwards. If detailing the vehicle on a slope, park uphill so that any run-off travels away from cleaned areas, and so that you won't be working in dirty conditions.

Note that cleaning underside and engine bay areas isn't just a matter of pride: it can also help identify leaks and rust before they have a chance to become established, aiding general vehicle maintenance.

SURFACE TYPES

Underbody areas of the car are made up of a similar assortment of metal, plastic and rubber fittings as on other parts of the vehicle – they just tend to get dirtier, more often, and can be exposed to some of the most extreme conditions found on a car (such as high engine and brake temperatures, and stones pounding wheel-arch liners). What may be more useful is a short summary of the actual underbody areas, their ease of detailing and the actual requirement to do so.

WHEEL ARCHES

Arguably the wheel arches are the most soiled area of the car, being a natural harbour for mud, gravel, brake dust and other contaminants. Surrounding areas may suffer from 'splatter' during the removal of these contaminants, especially if a high-pressure hose or powered washer is used. On the positive side, arches are usually lined with plastic or fibre arch liners and are therefore relatively easy to clean compared to some other underbody areas of the car.

ENGINE BAY AND UNDER-BONNET AREAS

Modern engine bays will usually feature a multitude of plastic covers, to keep the engine bay neat and minimize mechanical interference from the owner. This makes them much easier to detail than olderstyle engine bays, which have more exposed components.

The under-bonnet area presents a real challenge to detailers. Whilst it may not be subject to the volume and variety of contamination as the wheel arches and underside of the car, the engine bay usually remains open to the elements for reasons of access and cooling, and can therefore become soiled quite quickly; components can be covered in oil, and dirt may be baked on by high engine-bay temperatures. Furthermore, cleaning engine bays with water, especially if applied with a pressure washer or steam lance, may present a risk to sensitive electronics, meaning that robust detailing techniques could prove unsuitable. On the positive side, however, many modern engine bays are fitted with extensive plastic trim panels that are far easier to maintain, and these enhance overall presentation.

In material terms, the engine area will contain parts made of metal, plastic and rubber, with most of these components displaying a lower standard of finish than those parts on more visible areas of the car – under-bonnet components tend to be specified for maximum durability rather than maximum attractiveness.

DOOR SHUTS, BOOT AREA AND FUEL FILLER

The door shuts, boot and fuel filler areas are subject to only a mild amount of contamination, but they deserve special attention because they are rarely ever cleaned in the course of 'standard' car care. Over time, spilt fuel in and around the filler area can 'gum' and attract dirt, which could subsequently be stubborn to remove, door shuts will gradually become soiled from road grime, and the boot channels will fill up with leaves, twigs and other airborne debris.

These surfaces are most likely to be painted and will therefore pose few problems to a competent detailer, although it should be noted that they will sometimes be a lower standard of paint finish, perhaps without a clearcoat upper layer – after all, they are exposed to the elements less than other painted surfaces and subsequently need less protection. If a paint thickness gauge shows a reading of 30–40 microns less in these areas than on 'normal' exterior paintwork, this could indicate a lack of clearcoat. Care should therefore be taken when polishing these areas due to a higher risk of strike-through, although the omission of clearcoat can be useful – it may give an impression of how much clearcoat was applied to the bodywork overall.

Whilst door shuts are cleaned, it may also be worth checking the drain holes in the bottom of the doors themselves. These are easy to miss, and can lead to the bottom of the doors rusting if they become blocked. Pipe cleaners, used in combination with a vacuum cleaner, can help keep them free from debris.

VEHICLE UNDERSIDE

Rarely seen and difficult to detail, the vehicle underside is (perhaps rightly) ignored by most detailers. Concours competitions, however, may see the underside cleaned and prepared to high standards, and mirrors may even be placed underneath the vehicle to show off the finish to its maximum. Wintertime also gives a reason to clean this area of the car: the build-up of road salt can be removed to help guard against corrosion. Of course, even when clean, the underside is rarely much of a visual treat, with underseal (stone protection paint), rust and robust mechanicals the predominant themes. Metal components are most common, with plastic undertrays and rubber parts also featuring.

CONTAMINATION TYPES

Defects are rarely tackled in the underbody area (and if they are, the techniques found elsewhere in this book for similar surfaces/materials could be employed), so it is really a case of decontamination. Needless to say, the level of dirt to be removed is likely to be far higher than on other surfaces, and contamination near heat sources (such as catalytic converters and exhaust systems) could become ‘baked on’ and far harder to remove.

MUD AND DIRT (GRANULAR DEPOSITS)

The most common form of contamination will be mud and dirt flicked up from the road surface. Fortunately these deposits are likely to attach themselves only loosely to the underside, and have a low level of corrosiveness – salt-encrusted deposits during the winter months will be about as aggressive as these contaminants will get. Whilst dirty and unsightly, mud and dirt can normally be removed easily. It may even offer some form of protection to the bodywork if in a thick enough layer (assuming a low salt and moisture content) because it could form a barrier against stone damage.

GREASE AND GRIME

Unlike other forms of contamination found on the underside of a vehicle, grease and grime may be generated by the vehicle itself.

Particles of oil, grease and soot from the engine (and potentially other components) can be distributed by the slipstream and go on to coat the underside liberally, an effect exacerbated by leaking seals and/or gaskets. Exterior contamination may also comprise grease and grime, adding to the prevalence of these stubborn deposits. Detergents, TFRs, APCs – and even strong solvents/degreasers – may be required to remove them.

TAR AND RUBBER

Tar is a common contaminant on vehicles and seems to appear whether roads have been resurfaced or not, in all climatic conditions (not just during heatwaves or hot weather). Whilst it is largely unnoticeable on the underside of vehicles, it will congregate on, around and inside wheel arches (as will tyre rubber, in the case of track-day vehicles). Tar will take the form of small black/dark brown lumps or spots, with rubber being either a ‘streak’ (friction mark) or a ‘marble’ (blob of rubber, attached to the car).

RUST

Strictly speaking, rust is corrosion rather than contamination, and can take the form of surface deposits or a deep fatigue of the metal. Once the metal is heavily degraded, restoration may be inadequate or even impossible, but if the rust is light then it could be treated successfully with a specialist rust remover/converter, often without causing any adverse damage to the underlying finish.

CONTAMINATION REMOVAL

A lower standard of finish means that underside areas are predominantly cleaned, rather than ‘corrected’ or protected. And this also allows for more aggressive products and techniques to be employed (for convenience and/or economy), for there is less fear of a destructive cleaning product marring or staining a delicate finish and leading to unsightly results.

The pH-neutral maintenance products so beloved for paint care are often considered to be weak and ineffective when cleaning the hidden areas of a vehicle – and it would be wrong to disagree with this unless a particular component would suffer as a result (delicate rubber seals or gaiters, perhaps). Of course, show cars displaying the underside areas would need a far more cautious regime (although these vehicles rarely see much road use).

PRODUCTS

Traffic Film Remover/All-Purpose Cleaner

Generally speaking, APCs offer medium aggression (in cleaning terms and risk of attacking sensitive finishes) and TFRs are highly aggressive. Whilst APCs may sometimes just be an automotive shampoo with a small amount of added solvent to aid degreasing and tar removal, TFRs are usually highly caustic and therefore more likely to degrade sensitive finishes. Start with an APC and see if that works in your detailing regime; if it proves ineffective, experiment with TFRs (being mindful of the additional aggression towards components and finishes). Dark-coloured hire vans and vinyl curtains on ‘curtainsider’ lorries lose their shine and fade prematurely due to the reliance on TFR ‘truck washes’ by commercial vehicle operators. If you don’t have TFR or APC products, washing-up detergent could be used, although it will lack the ultimate cleaning ability of TFRs and APCs, as well as potentially containing salt (which could accelerate corrosion in under-bonnet or underbody areas).

Solvents and Degreasers

Some degreasers are specifically labelled for the task in hand, such as this engine-bay cleaner.

Tar and grease are major contaminants in any underbody or under-bonnet scenario, and both can be effectively combated with solvents and degreasers. The difference? Degreasers often contain strong detergents (soap) as well as solvent. Neat solvent may be more effective on certain types of spot contamination (for example tar), but degreasers could be a better choice for cleaning a larger area such as an engine bay, which contains a wider variety of contaminants.

Rust Removers and Metal Polishes

Due to the reactive nature of many types of metal, contamination could become bonded to the surface and may resist cleaning with normal methods. Specialist metal-cleaning techniques, including the use of rust removal solutions and metal polishes, may need to be employed. Rust removers can often be brushed on to a component in gel form, although removing a component and letting it soak in solution may be possible in some cases. For most metal components and surfaces, however, the use of fine grade wire wool and metal polish will prove sufficient to get them clean. Once rust has been converted or removed, the bare metal surface needs to be primed, painted and waxed/sealed to prevent corrosion from returning.

Cavity Waxes, Wheel-Arch/Stone-Chip Paint and Underbody Sealants

The underbody area has a number of specialist treatments to preserve and protect the car from the harsh conditions it experiences. These are arguably more suited to restoration than detailing, and certainly cavity waxes are designed to prevent corrosion inside a hollow car panel, way beyond the detailer’s remit. However, wheel-arch (anti-stone chip) paint and underbody sealants can be employed to help prevent damage from stone chips, corrosion from rust, and to repair or enhance the existing finish found in those areas.

EQUIPMENT

Pressure Washer and Attachment(s)

A high-pressure water jet is effective at cleaning wheel arches.

A decent pressure washer is essential for underbody cleaning, allowing wheel arches to be thoroughly cleaned. Karcher also make a specific attachment for cleaning the underside of a vehicle, although mud and debris is less likely to collect here than in the arches. Never underestimate the effectiveness of a jet of high pressure water: it can remove dirt effectively without the need for additional contact or chemicals.

Brushes

Spiral brushes may be effective at cleaning the spokes of wheels, but have limited use elsewhere. Shortbristled brushes with plastic collars are, however, useful for cleaning the engine bay, as well as around badges or around the wheel face, so these are an essential part of a detailer's tool kit. Natural and synthetic bristled varieties exist, but as long as the bristles are soft enough to prevent marring, and sturdy enough to robustly clean the intended surface, the type is of little importance (although synthetic filaments may last longer, especially if harsh chemicals are being used).

Always opt for brushes with plastic collars, though. These are superior to metal collars for two reasons: first, they will not rust or be eaten by strong acids used to clean wheels and so on; and second, there is less chance of them scratching the substrate surface or nearby components. Some detailers also use toothbrushes to reach inaccessible areas; children's toothbrushes or worn toothbrushes often have softer bristles than normal and are therefore particularly suitable.

Wire Wool

Fine-grade wire wool may be required to clean heavily contaminated metal surfaces. Under no circumstances should wire wool be used on plastic or painted surfaces.

Old Mitts, Basic Microfibres and Rags

Engine bays vary, but all get dirty, all need prep before detailing, and all should be detailed when cold.

Always save old mitts, microfibres and rags for dirty underbody areas. Once these lose softness or become so soiled that the pile does not fully recover after washing, put them to use in areas where the finish is less important. Paper towels – purchase the industrial rolls, not the expensive ‘kitchen roll’ variety – can be absorbent and useful for oil-soaked areas, but will tear and potentially disintegrate during use, increasing cleaning effort. A bale of budget microfibres, or old cotton T-shirts from a charity store, are alternative sources of underbody cloths if you’ve only recently started detailing.

MAINTENANCE REGIME

Regular detailing rarely involves anything more than mild cleaning of underbody surfaces, and the less visible areas will often be ignored totally. Whilst there may be some benefit in corrosion prevention and vehicle longevity in attending fastidiously to these areas, a crust of contamination may actually serve as a barrier against road salt, meaning that vehicles lacking a dedicated underbody care regime often show few adverse effects – especially when manufacturers underseal, galvanize and otherwise protect underbody components. Building a small underbody maintenance regime into your detailing scheme is all that is normally required, and can help prevent cross-contamination from the underside of the car to upper surfaces, as well as improving the overall standard of detailing achieved.

WHEEL ARCHES

If the wheels are being removed for cleaning, the wheel arch can be dealt with easily at this time (the use of axle stands is recommended – do not clean a wheel arch with the car jacked up and with no additional means of support). If you are not removing the wheels (as would normally be the case with a regular maintenance wash), attend to the wheel arches during the pre-wash stage. At any later stage you are likely to contaminate the surrounding bodywork with wheel-arch debris. Use a pressure washer or a hosepipe with a pressured 'jet' stream of water to clear loose contamination from the wheel arch by aiming the lance or nozzle upwards, between the tyre and wheel-arch lip. If no wheel-arch liners exist, be cautious of water ingress and consider skipping this process or washing the area carefully with the wheel off.

Once loose dirt has been removed, spray an APC or TFR solution into the wheel arch (or add APC into the pressure-washer dosing bottle, if it has such a feature) and clean the area a second time, before rinsing thoroughly with water.

UNDER BONNET/ENGINE BAY

Ensure that the engine is cold before detailing it – a hot engine could ignite the solvents used to clean it, and cause certain cleaners, dressings and protectants to cure more rapidly than advised, leading to inadequate performance, smearing or patchiness.

Eight-Step Method

1. Remove loose twigs and leaves from the channels and gaps surrounding the engine bay – an airline can be particularly effective here. You may even be able to blow into the windscreen-washer jet nozzles to keep them free from debris.
2. Cover areas sensitive to water ingress with clingfilm or duck tape and plastic bags (note: a hot engine may cause these to melt, so be careful with placement if any components are still warm), and use a water inhibitor (such as WD40) to seal electrics, if required. These areas will vary depending on the model of car, but typical components/areas to cover will include the ECU, fusebox and air intakes. The use of aluminium foil is not advised because of its potential conductivity causing accidental short circuits/sparks when used on or near the ECU, fusebox, battery and so on. You may also want to consider using cardboard or plastic sheeting beneath the engine bay if detailing the car on a clean block-paved or concrete drive: it is

a dirty process and oil/grime deposits can be stubborn to remove from the ground afterwards.

3. Use a hose with a gentle spray setting to wet the area, without dislodging the clingfilm. A pressure washer (at a distance) or steam cleaner could be used with caution. In the latter case, be wary of the steam melting clingfilm.
4. Spray APC liberally on to dirty components and engine covers; APCs tend to be acid free, so these are unlikely to attack any exposed metal components or trim in the engine bay, although they may be mildly caustic, so monitor the application for any adverse effects. Let the APC dwell for three to five minutes.
5. Wet the engine bay again, using a gentle water spray from the hose, and release the dirt by agitating with a soft, short-bristled brush.
6. Spray neat APC on to areas suffering from stubborn contamination, and work in the product with a stiff brush or suitable fibre scouring pad (being careful not to scratch the surface). Use neat solvent/engine bay cleaner/degreaser on contaminants that remain. Again, these may require dwell time, agitation and even multiple applications to be absolutely effective.
7. Rinse the engine bay thoroughly, remove the clingfilm and then dry using secondary-grade microfibre cloths – never use premium cloths as the engine bay is unlikely to be 100 per cent clean, despite the previous steps. Alternatively, remove the clingfilm and run the engine for five to ten minutes until dry. Now clean and enhance the areas that were under the clingfilm (when the engine has cooled, if it has run again).
8. Consider dressing or protecting the enginebay surfaces, assuming the engine is cool (*see* below).

DOOR SHUTS, FUEL FILLER AND BOOT

The door shuts, fuel filler and boot would normally be attended to after the main bodywork pre-wash stage, before the main wash. There is a very high chance of dirty run-off contaminating surrounding paintwork.

Five-Step Method

Hinges are dirty, but are dirty for a reason – the grease that collects the dirt is also lubricating the hinge, so if you clean the hinge you will need to reapply fresh grease afterwards.

1. These areas do not require a high-pressure clean because they are likely to be less contaminated than other areas of the car, and there is also a much higher chance of water ingress into the cabin or boot. You will use a light spray from a garden hose or contact wash technique (mitt and buckets).
2. Open the doors, fuel filler and boot, and remove any large items of debris (such as leaves and twigs from boot channels). If possible, use a light water spray to wet the areas, though this may not be possible with the door opening. Wet all remaining areas with a small hand sprayer or with a damp mitt, cloth or sponge.

3. Using the twin-bucket method (*see* earlier wash chapter), apply shampoo or mild detergent to the areas using a mitt, cloth or sponge. Then rinse with water and apply an APC, degreaser or tar remover to areas where contamination remains. After a final rinse, dry the areas with a secondary-grade microfibre cloth or drying towel.
4. Scratches, stains and other marks can be removed using mild polishes (chrome sill plates may be polished with metal polishes), but application of detailing spray may be all that is required to attain a satisfactory final finish.
5. If grease from door hinges, door catches and filler flap hinges has been removed in the cleaning process (typically using solvent and paper towels), re-grease them with a suitable lubricant (usually a white automotive grease).

DECONTAMINATION

Hinges are dirty, but are dirty for a reason – the grease that collects the dirt is also lubricating the hinge, so if you clean the hinge you will need to reapply fresh grease afterwards.

On some occasions, a mere clean of underbody surfaces will not be sufficient and a thorough decontamination may be required; perhaps as part of an annual spring clean, or as the precursor to attending a show or embarking on a restoration project.

WHEEL ARCHES AND UNDERSIDE

The wheel will need to be removed for decontaminating the wheel arch, and the vehicle safely supported on axle stands. Do not attempt to decontaminate the underside of the vehicle unless you have access to a vehicle lift or service pit. Ensure that all components, especially exhaust pipes and brake discs, are cold before embarking on any detailing work.

Four-Step Method

1. Check that the wheel-arch area and/or underside has been cleaned thoroughly with a pressure washer. Place cardboard sheets (use flattened cardboard boxes) beneath oily or very dirty areas to protect the floor surface or driveway.
2. Brush or sponge a strong APC solution on to the area and allow it to dwell, before rinsing with fresh water (ideally, use a pressure washer for this rinse stage).
3. Identify the types of contamination to be removed and where they are concentrated: tar spots, rubber blobs ('marbles'), rust and brake-dust contamination may be prevalent. Spray a strong solvent on areas covered with tar spots and rubber, being careful not to remove grease from suspension components or to spray the solvent on to hot components. Surface rust can be removed using a dedicated rust remover or fine-grade wire wool, although severely rusted components may need to be replaced – always repaint or treat bare metal surfaces that have been exposed after rust removal, to prevent re-oxidization. Brake dust can be tackled using wheel cleaners or fallout (iron) removers.

   Note that the use of clay bars (as used on bodywork for decontamination) may not be possible with regard to wheel arches or the underside, as the surfaces may be too irregular or rough and the process too time-consuming. The use of spray products is much more suitable.
4. Thoroughly rinse and dry the areas that have been treated. A leaf-blower, compressed air nozzle, or old microfibre towels are recommended for the drying process – do not use your finest microfibres due to the increased chance of soiling, despite the decontamination process that has just been completed.

Note that it may be worth moving the car if the wheel arches and underside are particularly dirty and have resulted in a large amount of debris falling to the ground, even if cardboard sheets have been used; this will minimize the chances of re-contaminating the car, and will also provide a clean working area for the rest of the detail.

UNDER-BONNET/ENGINE-BAY AREA

Only work on a cool engine – hot components could ignite flammable cleaning chemicals, and high temperatures will also make products less workable, decreasing their curing times. Ensure that zips and belts cannot catch on bodywork when you lean over the wing to work on the bonnet area; consider using wing protectors or microfibre drying towels to protect the wings if required. Also make sure that the bonnet is secured in its upright position if working deep in the engine bay – a secondary stay (a wooden stick or equivalent) is advisable to prevent the bonnet shutting accidentally during the detailing process.

Three-Step Method

There is a higher chance of marring when claying plastic surfaces, so employ plenty of clay lube and use only light pressure.

1. Remove as many covers as possible, and the battery. Some detailers would remove the bonnet as well, to aid access, but this may have consequences for panel fitment gaps, so it is not recommended. Essentially, you will not remove engine covers or panels for maintenance, but you should consider it for decontamination. Once this is complete, cover components that

could suffer from water ingress, as detailed above in the ‘Maintenance’ section, and clean the engine bay using an all-purpose cleaner and a short-bristled brush. Rinse with water using a pressure washer at a safe distance, but instead of running the engine to dry components, leave the engine bay wet.

2. Smooth plastic engine covers can be clayed using a fine-grade clay and clay lubricant – though soft plastics will mar readily, so use plenty of clay lube, and apply light pressure only. Rubber hoses and other components can be cleaned with strong detergents (such as washing-up liquid) or APC, and use a degreaser/solvent or tar and glue remover sparingly to remove grease marks. Metal components may be tarnished or rusty; they can be decontaminated with fine-grade wire wool and then polished with suitable metal polishes, or refinished to prevent the contamination returning. Suspension turrets and other painted areas can also be clayed and could even be polished (although note that paint thickness in these areas could be far less than on exterior bodywork).
3. Rinse the engine bay using a mild APC solution, and dry using old waffle-weave or shortpile microfibre cloths. Check for tar flecks and spots of grease throughout the engine bay, removing them, if found, using a degreaser/solvent or tar and glue remover. Bug carcasses and dead insects that remain in radiator fins can be removed using needle-nose pliers or detailing swabs. A steam cleaner could be used instead of, or in combination with, the APC spray, being mindful of sensitive components and any clingfilm used to cover them.

A fair amount of run-off can be generated during steam cleaning, so consider parking the car on an incline to channel the run-off to the rear of the vehicle and away from the detailing area.

DOOR SHUTS/BOOT

Being painted, the door shuts (door jambs and door pillars) and inner boot panels can be decontaminated with a clay bar in the same way as exterior bodywork. Whilst it would be possible to use a fallout (iron) remover, the type and amount of contamination will be limited and the action of a fine-grade clay bar will suffice. Grease near hinges can be removed using a tar and glue remover or similar degreaser/solvent, but remember to regrease the mechanism and latch afterwards. Polished metal sill trim plates are best wiped with a solvent to remove general contamination, and then polished with a suitable metal polish if tarnished. Remember that sill plates could be lacquered or covered in clear plastic, so ensure that they are bare metal before you polish them. Use a detailing spray or APC if they are of a more sensitive nature.

ENHANCEMENT AND PROTECTION

Underside areas are less likely to be dressed or protected by the detailer – they are inherently less visible than other parts of the car, and any protection required will often have been undertaken during manufacture (such as stone-chip paint, stone-chip protection film, galvanization). In rare instances, however, these surfaces may need more attention than would normally be the case – perhaps in the event of entry into a show and shine competition, or during restoration. Of course, many of the surfaces will be familiar: plastic, paint, bare metal and rubber can be enhanced or protected in their usual ways, whatever their location, although there should be an emphasis on robust protection – the underside and engine bay are particularly harsh environments, especially compared to regular bodywork/exterior painted surfaces.

WHEEL ARCHES AND UNDERSIDE

To treat wheel arches, remove the wheel and ensure that the car is adequately and safely supported. Wheel-arch linings will take the form of plastic liners, fibre liners or a tough painted finish. Plastic liners can be dressed or protected using the same plastic trim products used for exterior trim (traditionally silicone solutions), although longevity of dressings may be stunted given the area that they have been applied to. Fibre liners cannot be dressed, just painted with a matt black spray; while stone-chip paint is a thick, often rubberized paint with a dimpled appearance. This can be sealed with a durable wax or paint sealant, but all this is likely to achieve is superior cleaning for a limited period of time – in fact it would be more effective to apply a new coat of the correct paint, having thoroughly cleaned and prepared the surface.

The underside and underbody cavities may also benefit from dedicated anti-corrosion products, the most famous of which would probably be Waxoyl (a sprayable protective wax); other coatings may have stone protection or sound-deadening qualities, and may even remain partially uncured to allow them to 'heal' if damaged by a stone impact. Metal components could be painted, although many will be made from stainless steel, or will be chrome-plated or galvanized.

When cleaning suspension components, be wary of removing grease from moving parts with solvents – and if you do, ensure that the grease is replaced.

Finally, never use any kind of dressings or sealants on brake components, apart from high-temperature paints or temperature-resistant sealants on the exterior of brake calipers. Brake discs should only be cleaned with brake cleaner and should then be left untreated, despite the prospect of unsightly surface rust if the disc has been exposed to moisture and inadequately dried afterwards.

UNDER BONNET/ENGINE BAY

Traditional bodywork contaminants such as tree sap and tar are almost never found in the engine bay itself, although the high temperatures and greasy residues will mean that decontamination could still be necessary. There needs to be some assessment of what should be decontaminated, what should be left, and what should be replaced. Unless the vehicle is a show car, there is little to be gained by bringing every component and under-bonnet surface up to the highest level of finish. Concentrate instead on the areas with the most visual impact: the engine cover or cam cover in older vehicles, the hoses, battery and fusebox, water reservoirs and perhaps even the exhaust manifold. A strong solvent or degreaser – applied to cold components only – will remove grease and oil from components, whilst a pH-neutral fallout (iron) remover will tackle brake dust that has found its way into this area without being unduly aggressive to under-bonnet components.

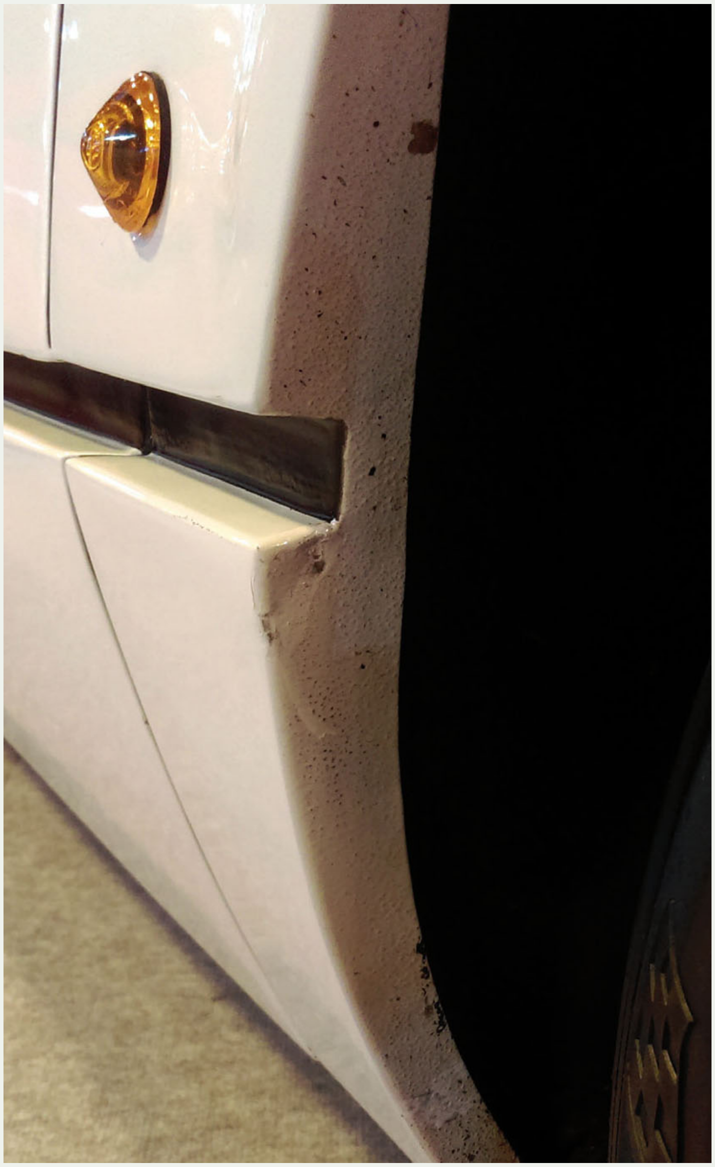
ACHTUNG! WARNING! ATTENTION!
Kühlerventilator kann jederzeit anlaufen.
RADIATOR FAN MAY START AT ANY TIME.
Le ventilateur de radiateur peut se déclencher à tout moment.
Hochspannung, vor Berühren der Zündanlage Motor abstellen.
HIGH VOLTAGE, SWITCH OFF ENGINE BEFORE TOUCHING IGNITION SYSTEM.
Haute tension, arrêter le moteur avant de toucher à l'allumage.
Bei Überfüllung besteht Gefahr für den Katalysator.
OVERFILLED ENGINE OIL CAN DAMAGE CATALYST.
Remplissage excessif d'huile dangereux pour le catalyseur.
Heisse Motorteile
Bewegte Teile
HOT ENGINE PARTS
MOVING PARTS
Pièces du moteur chaudes
Pièces en mouvement

Engine-bay stickers can often be replaced if they are damaged or can't be cleaned; try the parts department at your local main dealer.

For smooth plastic covers, consider claying them using a fine-grade clay and adequate lubrication. Wire wool and metal polish will be effective on bare metal components, though remember to protect them afterwards to prevent rust. Where rust or severe corrosion has occurred, use a dedicated rust remover, clean the part with wire wool and then paint it (use a high temperature paint if required), or replace the component entirely if practically and economically viable. Be careful if you find anodized fittings under the bonnet – these colourful aluminium coatings will be easily damaged or removed if attacked with abrasives, including certain clays, or harsh chemicals. Finally, engine-bay stickers can be relatively cheap and easy to replace with new versions if they are stained, torn or dirty.

Details such as this are what 'detailing' is all about, and they can improve the overall appearance of the engine bay – something that is especially important if the car is being entered into a 'show and shine' or concours competition.

ASSOCIATED ARCH AILMENTS



The wheel-arch lip is susceptible to stone-chip damage, as well as heavier contamination in general; take care not to increase the size of any stone chips during the detailing process.

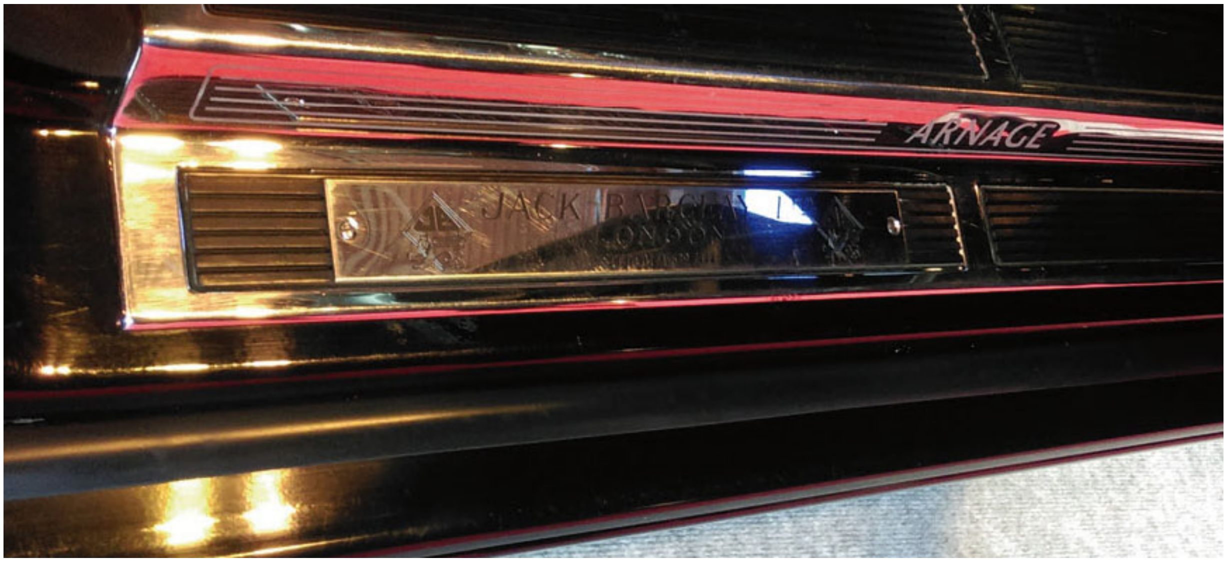
The wheel-arch area is subject to a great deal of stone damage, and the lip itself will suffer from contamination and paint chips. It is important to decontaminate the area carefully if using a solvent to remove tar specks, or if using a clay bar. Aggressive processes may cause any stone chips to increase in size or seriousness. Fallout removers may aggravate rust by stripping thin galvanized coatings that protect the bare metal exposed by a chip. 'Touching up' stone chips when found, after a thorough decontamination of the arch lip, is the ideal scenario and should prevent them getting worse. Stone-chip protection film (PPF: 'Paint Protection Film') may have been fitted to the arch lip or the surrounding area (sill, arch) to prevent stone damage, and this will provide hardy protection.

Watch out for discoloration of the film caused by the use of strong solvents and tar, however – tar should be removed quickly from stone-chip film, rather than being allowed to dwell, with a mild solvent or fine-grade clay (using plenty of clay lubricant). Traditional tar removers may discolour films, and often the film will 'yellow' with age anyway. If the film has become unsightly, it can usually be removed with a heat gun (to melt the glue beneath), before removing any glue residue present on the underlying paint with a strong solvent/tar and glue remover. New paint protection film can then be affixed. Manufacturers will normally supply this via their parts system.

DOOR SHUTS/BOOT

As with other underbody areas, the door shuts and boot will not generally require the same levels of decontamination as exterior bodywork – tar, tree sap and industrial fallout simply can't land on these surfaces in the usual way, so they need slightly less protection than regular panels. There will be an ingress of brake dust, grease and grime, of course, as well as the usual invasion of dust and dirt that seeps in via panel gaps. These contaminants can be removed using standard techniques – a robust wash with an APC if standard shampoo doesn't shift the dirt (although be careful with metal sill trim inserts, which could tarnish if strong chemicals are used on them), followed by flushing the gaps and shuts with clean water as a rinse. Fallout remover and/or fine-grade clay can then be used for brake dust, or solvents/degreasers/tar removers for persistent grease and grime.

So what of enhancement and protection? Well, enhancement of these areas will centre around polishing painted areas, either by hand or by machine, although the thickness of the paint may be thinner, perhaps because paint in certain 'interior' applications lacks a clearcoat layer or because fewer clearcoat layers are used compared to exterior bodywork. Small spot pads and extensive masking would be required for machine polishing, but hand polishing will often suffice. Remember that the sills are going to mark easily as people get in and out of the car, so striving for a perfect finish may be futile.



Sill plates can be polished and protected, but be careful if they are physically stepped on when getting in and out of the vehicle: a non-slip finish may be more suitable in these cases.

After polishing, painted surfaces can be protected with a wax or sealant in the usual manner (*see* previous chapter on exterior bodywork). Polished or chromed metal sill trim plates can be enhanced with the correct grade of metal polish (this may even remove minor scratches) and then protected with a metal sealant. Deeper scratches may be more problematic to remove, requiring far more aggressive metal polishing techniques, and replacement of the trim plate could be a preferential route in severe cases. Polished and sealed sills are going to be more slippery when wet, though, so if the sill is used as a dedicated tread plate, it could be better to strive for a non-slip surface: perhaps decontaminate the sill thoroughly, and after suitable masking, spray on a clear, non-slip lacquer designed to improve grip.

CHAPTER SEVEN

INTERIOR SURFACES

THE KNOWLEDGE

Interiors are rarely the main focus of detailers. They have few surfaces to machine polish, rarely get exposed to harsh contaminants, and often simply need the attention of a soft cloth, detailing spray and vacuum cleaner. However, modern interiors will be constructed from a wide variety of different materials, some requiring specialist care, and the methods needed to decontaminate and protect them may differ vastly from those for exterior surfaces.

SURFACE TYPES

Unlike exterior surfaces, interior surfaces are rarely painted or coated. They don’t need the same level of protection because the contamination they meet is less frequent and less severe. However, fashion has led to more adventurous finishes finding their way into car interiors, so it is important to assess the nature of an interior surface and then to identify the products and processes required to clean, enhance, protect and maintain it.

SMOOTH PLASTIC INTERIOR SURFACES

Car interiors rarely get as contaminated as car exteriors, but the wide variety of surface types and the prospect of limited access/restricted movement can make them challenging to detail.

Durable plastics revolutionized car interiors, proving far more stable to temperature and moisture variations than wood. Smooth plastics often have a gloss finish, making them dirt resistant and easy to clean. However, they may be too shiny for upper dashboard and binnacle areas (because of windscreen reflections), and they can also show up fingerprints easily.

TEXTURED PLASTIC INTERIOR SURFACES

Textured plastic is the 'go to' finish for hard surface interior trim. It is durable, robust and less reflective, and unlikely to show marks as easily as smooth trim.

When it comes to vehicle interiors, textured plastics are far more common than smooth plastics because they are less reflective and less likely to show fingerprints and other blemishes (for example, small scratches). However, their rough surface texture does mean that abrasive products or those with opaque residues should not be used on them, as the finish could be affected by the product 'dusting' once the solvents fully outgas, or it could even be damaged by the abrasive action. Textured surfaces may also be fractionally more difficult to clean because dirt can collect in the grooves and channels in the patterned finish, and cleaning cloths may struggle to remove contamination – but generally the benefits of textured plastics will exceed the disadvantages.

LEATHER

Most modern leather finishes are 'coated' rather than traditionally dyed. Effectively they are painted surfaces and can therefore be approached in a slightly different way to classic 'aniline' leather.

Leather isn't just used to upholster seats – it can be used to cover dashboards, steering wheels, door cards and even headlining. Supple, hard-wearing and attractive, it is used extensively in luxury vehicles, although it is worth noting that most modern leather automotive finishes are really a thin, painted layer of leather (sometimes glued to a synthetic backing), rather than the ‘aniline’ leather used in classic cars. Aniline leather is true ‘hide’: dyed animal skin. Modern leather materials are heavily processed to improve resistance to wear and tear, increase consistency of finish and reduce costs. Connolly Leather is perhaps the most famous automotive leather brand (historically) with ‘connollization’ referring to a sophisticated preparation and colouring technique used by the company. As long as a distinction is made between a dyed ‘natural’ leather and a painted ‘coated’ leather, then the correct choice of products can be made, and the most suitable processes to clean, enhance and protect them can also be determined.

VINYL

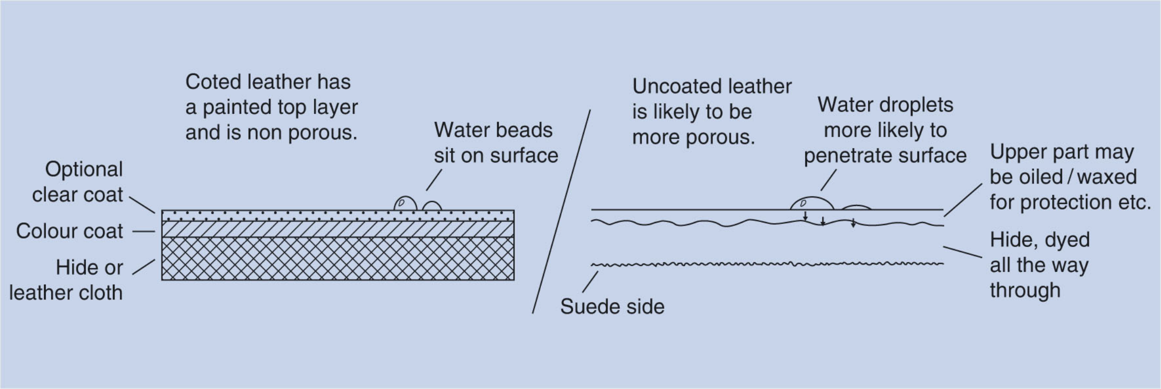
Essentially, ‘vinyl’ is a synthetic leather-type material made from plastic (usually polyvinyl chloride, or PVC). It is typically sprayed/affixed to a cloth backing so it can be handled and manipulated like regular material. Being made from plastic, vinyl is generally hard wearing, easy to clean, and can be moulded in a variety of patterns (for example, leather grain), making it an extremely practical choice for vehicle interiors. However, it can become hot and sticky in certain climates, and ultimately it lacks the charm of more natural materials because of its linearity.

FABRIC/TEXTILES (INCLUDING HEADLINING)

Alcantara, or synthetic suede, is a fashionable choice of interior fabric. Manufacturers often use a selection of materials for aesthetic and practical purposes.

A wide selection of natural and synthetic fabrics and textiles may be used in car interiors, perhaps for covering seats, door cards and trim pieces, or for use as headlining (the internal lining of a vehicle's roof). Velour is a popular style of fabric, and more exotic materials, such as alcantara (synthetic suede), may be encountered. Most of these materials are likely to exhibit some form of absorbency, making them susceptible to stains and dirty marks, and they may be cut or torn if treated roughly. However, they are soft to the touch, have good sound-deadening characteristics, and a resistance to minor scratches.

COATED LEATHER VERSUS UNCOATED LEATHER: THE DROPLET TEST


Coted leather has a painted top layer and is non porous.
Water beads sit on surface
Optional clear coat
Colour coat
Hide or leather cloth
Uncoated leather is likely to be more porous.
Water droplets more likely to penetrate surface
Upper part may be oiled / waxed for protection etc.
Hide, dyed all the way through
Suede side

Coated versus uncoated leather.

It can be difficult to distinguish coated from uncoated leather, although you are far more likely to find coated leather in modern vehicles. Aniline (uncoated) leather has a less regular grain and may absorb a drop of water more readily (although absorption may be slow, and it does depend on how heavily the uncoated leather has been treated). Coated leather will not absorb water at all, if droplets are applied to the surface.

CARPETS AND FLOORMATS

Thick synthetic carpets typically cover the floorpan of a vehicle's cabin, offering sound and heat insulation, as well as protecting the floorpan from scuffs and scratches. These carpets will usually be made from tough nylon or polyester fibres, although rubber heel patches and floormats may be used under pedals and other areas subjected to high wear. Floormats are frequently removable to aid cleaning; the foot wells tend to collect the most dirt and debris. Finally, remember to move (or even remove!) seats during cleaning;

they should be moved backwards and forwards as required, to increase access to the carpet and floormats. Some detailers neglect to do this, but it's a simple way to maximize the effectiveness of the interior cleaning process.

SEAT BELTS AND HARNESSES: TO CLEAN OR NOT TO CLEAN?

Some people argue that seatbelts and harnesses should not be cleaned for fear that they lose structural integrity and therefore present a danger to the occupants of the car in the event of a collision. The reality is that as long as any inertia reel mechanism, or other locking function, is not impeded by water ingress (which may cause rust), and that mild cleaning agents are used, seat belts and harnesses *can* be cleaned. A mild APC or car shampoo solution is ideal for cleaning and maintenance, though never use neat APC or stronger chemicals.

After cleaning, stretch the belt out to aid drying. The belt material should *never* be dressed – shiny belts covered in silicone dressings may look good but they may lack the necessary friction to restrain the occupant in a crash.

WOOD TRIM

Wood is rarer in modern cars because it is less stable and tastes have changed. However, it is a beautiful material and synonymous with luxury. Wood trim usually takes the form of a heavily treated wooden veneer, and some 'wood' finishes are actually wholly synthetic.

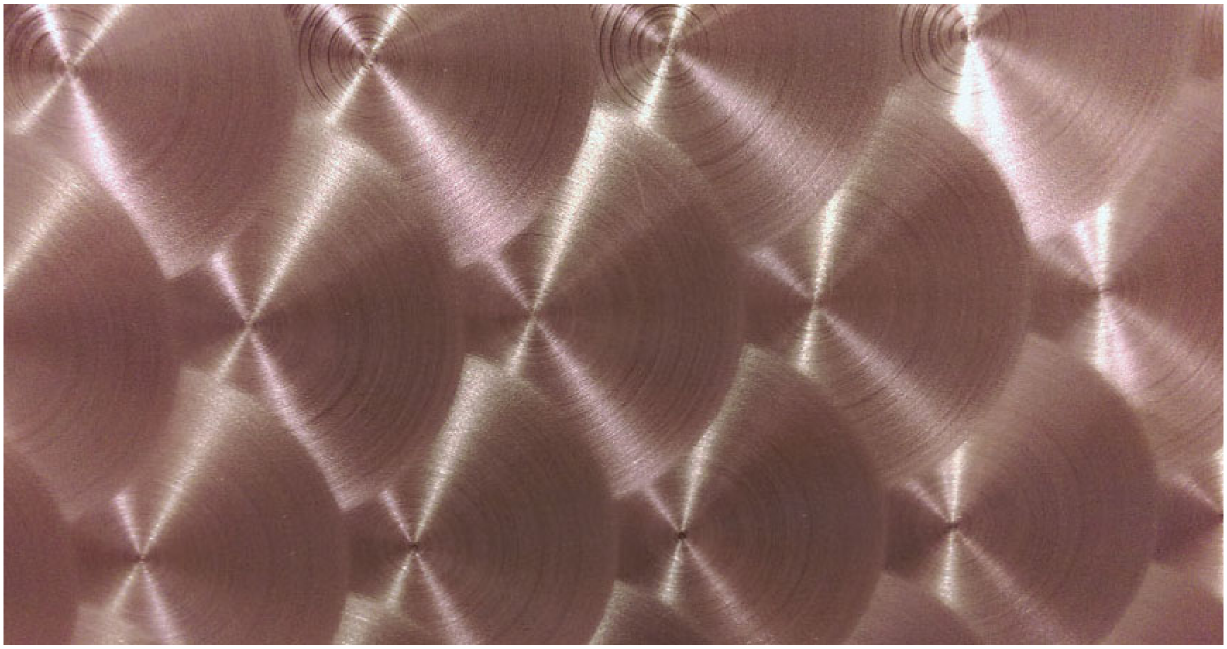
Wood is not as popular a choice for car interiors as it once was, yet it is still a practical and fashionable material in certain applications. Beautiful when correctly finished, it can be load-bearing or cosmetic, used in thick sections or thin veneers, and crafted and repaired relatively easily. Modern interiors will use wood sparingly, largely due to cost, but also because wood can be less stable as a material and therefore more prone to warping or bleaching. Because of this, plastic has largely replaced wood in car interiors, although veneer trim panels will frequently be found inside luxury cars. These veneers are heavily lacquered (clearcoated) and can, in effect, be treated like clearcoated paint panels. If the wood is merely stained or lightly lacquered then a different approach will be required; sanding and repairing wood in these cases can involve more traditional woodworking and wood-finishing techniques.

PAINTED FINISHES

Interior trim pieces may be painted, but be careful because the finish may be soft and could mark easily. Only machine polish with extreme caution, especially considering the restrictions imposed by the cabin and the potential mess created.

Painted components may be found within the interior, either in a finish to match the exterior paintwork, or in a bespoke finish (for example, ‘piano black’ paint). They can be cleaned, enhanced and protected in much the same way as painted exterior surfaces of the car – although note that ‘piano black’ paint can be extremely soft and easy to mar, and that polishing results may vary depending on whether the paint has been applied to a plastic or metal component (plastic finishes may be softer, and heat will not dissipate as quickly if a machine-polishing technique is used). Note that carbon-fibre trim will invariably have a lacquered/resin finish, and it should therefore be treated as ‘painted’ trim.

METAL FINISHES



Patterned metal finishes, such as this ‘machineturned’ effect, could be permanently damaged by aggressive polishing.

Bare metal finishes may take the form of a solid piece of metal (perhaps cast or machined), or simply a thin veneer of metal applied to another material (usually plastic). If the metal is clearcoated (lacquered) for protection, it should be treated as painted interior trim. But if it is bare metal, then a variety of traditional metal-polishing techniques can be used to clean and enhance the finish, assuming that the metal is not patterned (for example with a ‘machineturned’ effect). Patterned or textured metals can’t be polished without potentially removing or changing the nature of the finish.

PLASTIC-/RUBBER-COATED TRIM

Some trim may be coated in a thick layer of plastic or rubber, instead of being painted. Switchgear is occasionally rubber coated to increase levels of grip, and plastic films are often used to create the impression of a wooden, metallic or carbon-fibre finish on trim panels. Note that plastic chrome finishes may be painted on, rather than applied as a film, and these should therefore be treated as painted finishes, as described above.

INTERIOR GLASS AND MIRRORS

The inside glass of the windscreen, side windows and rear window are all classed as interior surfaces, being subject to less severe contaminants. The central mirror, vanity mirrors and any sunroof panels are also treated in the same way. Interior mirrors and glass are generally cleaned with similar products and processes as those used for exterior mirrors and glass, but contamination may be lighter, so a less rigorous regime is more suitable. Furthermore, be wary of window tint paint and films: these darker finishes are applied to the internal surface of the glass, and could be affected by aggressive cleaning products or processes. Little is used to enhance or protect interior glass after cleaning, but anti-fogging agents could also be applied to increase visibility in humid cabin conditions when condensation may occur.

CONTAMINATION TYPES

Interior contaminants are generally less aggressive and less numerous than those found outside the car. However, because of this, interiors are frequently overlooked and may be left unattended for many months, allowing contamination to build up (which may then be more difficult to remove).

MUD AND DIRT (GRANULAR DEPOSITS)

Luckily, mud and dirt are far less prevalent on the interior of vehicles, but carpets, floormats, door sills and door jambs can still suffer from this heavier contamination – there is simply little way of stepping into a vehicle without introducing granular deposits of some kind. Carpets and floormats tend to be dark in colour and made of a suitable material to resist the effects of contamination, and should also be relatively easy to clean.

GENERAL GREASE AND GRIME

Door hinges and latches will be very greasy, but most oily contamination found inside the cabin will be from foodstuffs, fingerprints, cosmetics and toiletries (especially sun-cream), or from unwanted detailing products. Grime transferred from technician's dirty hands, clothing and tools will also be a possibility if any work is carried out on the vehicle; light-coloured interiors are particularly prone to visible contamination.

DUST

Small fibres and particles floating around the cabin will be distributed by the ventilation system and interior movement, settling on most surfaces, even those that might seem inaccessible, such as the underside of seats. This is the easiest form of interior contamination to remove, and it is also unlikely to scratch or mar soft materials (unless it is a powder by-product of tasks such as drilling hard materials in the cabin).

ANIMAL HAIRS

Pets travelling in cars are likely to leave a large quantity of hairs behind on soft surfaces such as carpets and fabric upholstery. If viewed microscopically, hooks may be observed on these hairs, and this feature makes them far harder to remove from fibrous materials than human hair. Compounding the issue of removal is that of odour, as oils and dirt attached to the hairs may result in unpleasant smells – and these will undoubtedly linger as long as the hairs remain.

SPILLAGES

Hard surfaces resist spillages with ease, but unprotected, absorbent, soft materials (such as seats and carpets) will be susceptible to contamination from liquids. In the mildest case, this will be water; in more severe instances the spillage could be oil, paint, a dyed solvent-based product, or even blood or vomit. These latter contaminants may prove difficult or inconvenient to remove, whereas plain water may frequently evaporate with little or no ill effects. Note that spillages will gravitate to the lowest point on a section of material and be caught by the seams, so the lowest, deepest seams, pleats and stitching will be particularly susceptible to contamination and stains.

UNPLEASANT ODOURS

Smoke and animal odours are the most common and pervasive smells likely to be found in vehicle interiors. Their removal relies on the eradication of the source of the odour, followed by neutralization of the smell itself.

TYPES OF DEFECT AND IMPERFECTION

The interior of a vehicle is susceptible to lower levels of contamination and damage than the exterior, but the cabin and boot compartment are still ‘lived in’ or regularly in use, meaning that they will pick up their fair share of inadvertent scratches, scrapes and scuffs. Passengers will often treat a car interior like a house interior, where detailing techniques are unknown, and they may not even be aware of sensitive finishes or the common ways in which damage could be caused.

SCRATCHING/MARRING TO INTERIOR PLASTIC SURFACES

Any material harder than plastic could potentially scratch it upon contact – and if that plastic surface is textured, it may be difficult or even impossible to repair. Invariably this means that metal buckles, studs and zips need to be kept away from plastic panels and components, and any tools, shopping or other items transported in the vehicle need to be stowed carefully and prevented from moving freely if they could potentially cause damage during the journey. Damage could range from deep cuts to light scuffing, and if a wider range of scenarios is imagined, interior plastics can also be faded by the sun (dash tops being the most affected) and even melted (by a cigarette lighter or cigarette).

SCRATCHING/SCUFFING OR DISCOLORATION OF LEATHER

Most modern leather takes the form of a coated material, and it is this coating that is most at risk of damage. Because it is a type of flexible paint, it is not particularly scratch resistant or robust and can be damaged relatively easily by contaminants or clothing. Jeans studs are particularly harmful, but even everyday clothing materials and grit/dirt particles can be abrasive when worked into the coating. As well as scratching and scuffing, the lacquer and colour coats can be worn away in patches, stained or discoloured. Fading from sun damage (exacerbated by lacquer removal) is also a possibility. Note that traditional ‘aniline’ leather, where the colour is dyed all the way through the hide, may be more robust and less likely to show damage – but it could be even more difficult to repair.

TEARS, DISCOLORATION AND DAMAGE TO FABRICS

Interior fabrics are subject to wear, tears and fading. Seats and dashboard coverings are likely to be the worst affected.

Fabrics can be permanently damaged, whether in terms of tearing or discoloration (bleaching by the sun is typical, but they can be discolored or marked through contamination). Whilst repair is more difficult, it is not impossible, and fabrics can be dyed back to the original colour if bleached, and tears can be repaired (although the original damage may still be somewhat visible).

CONTAMINATION REMOVAL

Interior contamination can generally be classed into two types: ‘immediate’, where the contamination occurs quickly and in a focused, definite area; and ‘incremental’, where the contamination builds up over a long period of time, over wide areas, and may not even be noticed. ‘Immediate’ contamination is easy to spot and tends to be dealt with quickly and robustly. Yet it is the ‘incremental’ contamination that can perpetuate for years and lead to perhaps the most catastrophic effects, allowing surfaces to subtly and gradually degrade to a level where they may be impossible to repair.

PRODUCTS USED IN CONTAMINATION REMOVAL

Quick Detailer Sprays and All-Purpose Cleaners

These sprays are the mainstay of interior detailing, and will usually be abrasive/particulate free and therefore unlikely to leave residues. They should, however, clean hard surfaces (and soft surfaces, in the case of APCs), and ‘quick detailers’ are particularly suited to sensitive finishes due to the additional lubrication they provide. APCs will be better for tougher decontamination work, especially if this involves the removal of grease or oily deposits.

Leather Cleaners

These will be formulated to clean leather and vinyl surfaces, but they can vary greatly in composition. Some may be creamy in consistency (or opaque rather than clear) and potentially contain microabrasives to ‘scrub’ the leather clean. These may damage deteriorating leather finishes further, and if oils are used to lubricate the abrasives, these may leave a sticky residue on the leather that could attract dirt (and therefore become ground into the leather finish later on). Non-abrasive cleaners are therefore safer in many respects, but they can contain strong detergents, solvents and other chemicals, so initiate a test patch on an inconspicuous area first (if you are not sure of the effects), and exercise extreme caution with antique leather finishes or leather that has already started to fatigue and deteriorate.

Glass Cleaners

Professional-quality glass cleaners usually have a high solvent content to prevent smearing and increase performance.

Like leather cleaners, glass cleaners may sometimes be best described as ‘polishes’ if they contain microabrasives to grind and buff the glass clean. Abrasive content is no issue with glass in the majority of cases, because glass is difficult to mar or scratch – although a lot of polishing residue ‘dust’ can be created, and this may be frustrating to remove later. Most glass cleaners will be non-abrasive, however, and take the form of liquid cleaners based on detergents, solvents and mild acids. Because the solvent-based products that professional detailers prefer are often flammable and therefore have storage and handling risks, many glass cleaners found in high street shops are far milder (and potentially less effective) ‘vinegar’-style recipes (acetic acid has historically been used as a glass cleaner) that rely on detergent content and mild acids to do the majority of the work.

Air Fresheners and Deodorizers

Stubborn odours need the attention of an aerosol ‘fogger’ can; this will completely empty over the course of an hour whilst the (empty!) vehicle’s ventilation system is recirculating.

Bacteria and organic residues are regularly caught within the textiles furnishing a vehicle interior, and the warm and comfortable conditions do little to subdue them. Add in some spilt milk from the grocery store, mildew from damp carpets or a wet dog being transported in the back of the car, and offensive odours can really take hold. For these more severe odours, a ‘fogger’ (an aerosol can that empties itself and re-circulates through the ventilation system for a period of time) or strong deodorizing product with specialist ingredients (such as enzymes or silver chloride) may be required.

For general ‘day-to-day’ freshness, regular air fresheners will suffice. These may take the form of card ‘hangers’ dangling from the central mirror, gels or wick-soaked scents in small cans, dispensers that attach to air vents, or just hand-held finger-pump sprays; be careful only to open wrapped ‘hangers’ or cans a small amount to prevent the fragrance dissipating too quickly. Rarely more than water, emulsifier, solvent and a fragrance, these may be able to mask light odours, but cannot tackle them in the same way as aggressive deodorizers. If using a spray-type air freshener, spray the product on to carpets (perhaps under the front seats), on to the headlining (but only if the liquid is colourless, because there is always a potential risk of staining) or into the air vents.

Finally, note that the source of any odours should be identified and removed before any attempt at air freshening or deodorizing is made, otherwise the original unpleasant odours will inevitably return. If there is no obvious source of musty odours, try changing the cabin air/pollen filters.

EQUIPMENT USED IN CONTAMINATION REMOVAL

Tornador Wet-Air Spray Gun

The Tornador is a specialist interior cleaning tool, combining air and liquid to remove contamination from vents, trim gaps and so on. It requires an air compressor to work, so may not suit all detailers.

The joins in plastic dash sections, trim and other panels mean that there are many cracks and crevices within a vehicle interior, and these can all harbour dirt. Air vents, access panels and trim covers may also keep dirt hidden in unseen areas. The Tornador wet-air cleaning gun (other similar products may be available) attaches to a compressed air line and then pulses liquid (water or solvent-based cleaning solution) at a targeted area to dislodge dirt and grime; air is then channelled through the ‘barrel’ to dry the affected area, after the dirty residue has been collected using a microfibre cloth. These wet-air sprays work particularly well on soiled, high-mileage interiors that have a lot of dirt encrustation and residue build-up. Note that a reasonable air compressor is required to operate this item of equipment, so it may only suit professional detailing shops or the best equipped amateur detailing bays.

Air Duster or Air-Line Gun

Air compressors are useful for operating Tornador guns (*see* above), but for dry, loose residues and dust, a simple air-line gun attached to the hose can be an effective and economical alternative. Note that it is worth vacuum cleaning the interior after dislodging the particles, because they will not have been removed from the interior, just blasted into a different location.

Vacuum Cleaners (Wet and Dry) and Steam Cleaners

Vacuum cleaners need little introduction, although it is worth noting that wet/dry vacuum cleaners with long extendable hoses are the most useful for detailers. The ‘wet’ function allows them to clean carpets, seats and fabric trim panels far more effectively, although the vehicle will be damp after treatment and will need an adequate period of time to dry out. Standard ‘dry’ vacuum cleaners will suffice if a wet vacuum cleaner is not available, but they will struggle with heavy or ingrained dirt in fabrics (especially if the fabric is deep pile). Dry vacuum cleaners best suit the removal of light, dry dirt of a granular nature, such as crumbs, leaf debris and dust.

When vacuuming, always start at the highest point in the vehicle interior, and then work your way ‘downwards’. This ensures that any dust that has been disturbed or ‘missed’ during the cleaning process will settle on a lower surface to be vacuumed up later. Steam cleaners can be effective on upholstery and carpets, especially because they can be less ‘wet’ than wet vacuum cleaners in operation, and because the steam will naturally sanitize the surfaces it touches – all without the need for additional chemicals. This makes them ideal for petsullied interiors, which could potentially harbour more odour-causing bacteria.

Interior Buffing Cloths

Interior plastics and glass tend to be less scratchprone than exterior paint, with the exception of ‘piano black’, gloss-painted trim panels. Whilst extra-soft deep pile ‘plush’ microfibres should be used on sensitive painted components, regular short-pile microfibres will normally suffice on general smooth/textured plastic surfaces. Invest in some non-linting microsuede cloths for use on rougher textured plastics and ‘grabby’ upholstery such as alcantara or suede. Interior cloths will rarely get as dirty as cloths used for exterior detailing, but interior cleaning tends to be far less frequent and so heavy deposits can still be encountered. Always use clean cloths for interior detailing tasks, and fold them or turn them regularly to prevent a build-up of contamination; wash microfibres thoroughly when they become soiled.

Glass Cloths

Waffle-weave microfibre is a perfect material for interior as well as exterior glass; it is absorbent and has good ‘bite’. Whilst you can use the same cloths for both purposes, interior glass and mirrors become less contaminated than those exposed to the outside elements, so having a dedicated cloth for interior glass is a reasonable proposition.

Detailing Sticks/Swabs and Cotton Buds

Detailing swabs remove contamination that a finger and microfibre cloth may not be able to reach. They can be particularly useful when it comes to cleaning trim panel gaps and joins, and interior corners and recesses.

These small sticks have a fibre tip at one end to remove dirt from grooves, vents and restricted areas. Cotton buds will be inferior to lint-free detailing sticks because they will be harsher to delicate finishes and may also unravel and shed fibres, but they will be much cheaper. Dipping the head of the stick/bud in a mild APC solution, or shampoo solution, will improve its cleaning abilities; this technique also works with dry cloths that are failing to remove the requisite amount of contamination. Wooden cocktail sticks could also be used to carefully pick out crumbs and other detritus from small cracks and gaps within the interior, but they should only be used as a last resort as they are likely to scratch sensitive finishes.

Sticky Rollers and Pet Hair-Removing Combs

Pet hairs are notorious for being difficult to remove from soft surfaces, and a sticky roller or dedicated pet hair-removing tool could prove useful. Sticky rollers can also tackle lint and small particulates. If using a pet hair-removal tool, ensure that the tines of the comb won't be too aggressive for the surface being cleaned. Softer rubber versions do exist and are perhaps the safest option; the rubber naturally collects pet hair because of its relatively rough texture (when viewed microscopically). This has led to some detailers even using rubber mechanics' gloves to remove pet hair.

MAINTENANCE REGIME

Whilst the interior of a vehicle doesn't need cleaning as regularly or aggressively as the exterior, it must not be overlooked. If the vehicle is washed fortnightly, ensure the interior is vacuum cleaned and detailed every month. It is easy to 'forget' about the interior, as the exterior appearance of a vehicle is what tends to define the standard of detailing, yet the interior can become gradually contaminated to the point where surface finishes may be permanently compromised, and the possibility of simple and effective cleaning of interior trim and components will have passed. A little maintenance, but often, will help keep the interior clean and in good order for the life of the vehicle.

SMOOTH AND TEXTURED PLASTIC INTERIOR SURFACES

Switchgear should be treated with care, as rubberized buttons and lettering may be damaged if aggressively cleaned, and never use too much water or any great quantity of liquid products for fear of affecting the electrics.

Smooth plastic is easy to clean, assuming it is relatively hard in consistency, and it will not show abrasive residues after the application of mild polishes and treatments. It can, however, show a patchy and inconsistent finish in certain lights if oily or protective products are used. Never over-apply products, and ensure that they are buffed ‘dry’ and ‘level’ after application, to avoid any issues. In most cases a quick detailer or APC spray will be the product of choice for cleaning hard plastics, with a mild water-based quick detailer used on more sensitive, or softer, or rubberized finishes. A soft, short-pile microfibre can be employed for application and buffing, turning it in between stages. For sensitive finishes, substitute it for a plush, deep-pile microfibre, or a soft microsuede cloth if the soiling is light (and therefore low in granular contamination). Air vents can be cleaned with a microfibre cloth wrapped around a toothbrush handle, and a quick detailing spray or mild APC solution.

For ‘soft touch’ buttons, gently apply quick detailing spray and wipe carefully with a soft, lint-free cloth. Strong APC solutions and solvents are likely to damage the rubberized coating irreversibly.

LEATHER AND VINYL

The methods for maintaining leather and vinyl are similar, and the same methods can generally be employed, but note that vinyl is usually harder wearing and less prone to damage from detailing chemicals or abrasives than leather or synthetic leather. Once again, a microfibre cloth (short pile is usually fine) and non-abrasive quick detailer, dedicated leather cleaner or mild APC solution can be used for general maintenance, but be wary of granular contamination – use a lubricated quick detailer and piled cloth to remove this gently, before continuing with the cleaning process – and damaged or degraded areas. If in doubt, test the action of cloth and spray on an inconspicuous area, and never rub aggressively initially. Heavier decontamination may require abrasive leather cleaning creams, stronger APC solutions, or abrasive sponges (*see* below).

Note that after cleaning, the leather or vinyl area should be buffed dry and any stitching carefully 'blotted' to remove excess moisture. Cotton stitching can rot or fail if subjected to moisture or strong chemicals for extended periods of time.

FABRIC UPHOLSTERY AND TRIM (INCLUDING HEADLINING)

Light maintenance of fabrics should never involve getting them wet, due to the risk of subsequent water marks. Instead, they should be patted to dislodge dirt, brushed with a short-bristled brush and a pet hair-removal tool (or sticky roller), then vacuum cleaned. If a small patch of contamination is found – for example a small, melted crumb of chocolate – remove as much dry residue as possible and then tackle the underlying stain with a mild APC spray and a clean, colour-fast lint-free cloth: waffle-weave microfibre cloths are ideal.

Note: If cleaning fabric seats, always work from the inside, out (that is, from the middle of the rear bench, or from the inside edges of the front seats) – this prevents previously cleaned areas from becoming re-contaminated later on.

CARPETS AND FLOORMATS

As with fabrics, carpets and fabric floormats should simply need vacuum cleaning – wet cleaning of them should be classed as decontamination. Floormats need to be removed, and hopefully will have borne the brunt of the regular contamination. Shake and beat them at a good distance from the car, then place them on a clean, flat surface for vacuum cleaning in isolation from the vehicle. Use a stiff, short-bristled brush to dislodge crusty dirt, and then vacuum clean the pile. After the first set, brush the floormat again to dislodge particles deep in the pile, and vacuum clean the floormat a second time. Chewing gum may need a solvent or dedicated chewing-gum remover, otherwise a strong APC should shift most spot contaminants encountered during regular cleaning. Muddy or heavily soiled floormats should be fully decontaminated with a wet process, as outlined below.

We have assumed that the floormats are made of fabric, but some will be rubber, and these are far easier to clean. Just remove from the car, wash with a (robust) sponge or cloth and shampoo/APC solution, rinse and dry. Suitable rubber dressings can be applied afterwards for enhancement and protection, but ensure they buff 'dry'.

Carpets can be treated in a similar way to fabric floormats, but they should be less contaminated, and cannot be removed to be 'beaten' or shaken. Vacuum them when dry, having dislodged the dirt first with a stiff brush, and being careful not to pull the vacuum cleaner into the doorsill if the body of the machine lies outside the car – then move on to 'spot' cleaning if necessary. Carpets can be rougher, and the use of non-linting cloths for spot cleaning is essential – regular dusters may deposit fine yellow fibres that will prove tricky to remove.

WOOD TRIM

Before attending to wood trim, identify whether it is coated – for example with a clearcoat or lacquer – or 'natural' – either with no finish, or just a stain or wax. If it is coated, a quick detailer or mild APC spray could be used, in combination with a soft microfibre cloth.

Uncoated stained wood needs to be wiped with a lint-free cloth and a suitable wood oil (such as teak or linseed oil). Uncoated waxed wood needs a quick detailer at most; an APC could remove the wax. As for uncoated wood with no other finish, its relative absorbency could lead to issues with any liquid product, no matter how mild, so ‘dry dusting’ the surface with a lint-free microfibre would be the safest course of action.

METAL FINISHES

When metal trim is encountered, establish whether it is metal veneer, solid metal or metal-effect plastic – and if possible, whether it is coated or uncoated.

Thin metal veneers, frequently ‘brushed’ in appearance, and genuine chrome plating are the most common kinds of metal finish found in a vehicle interior. These will, of course, generally be found in premium and classic vehicles; most modern interiors rely on chrome paint and metal-effect plastics to create a similar effect at far lower cost. The metal may be coated with a lacquer or clearcoat for reasons of finish and protection, or it could be ‘bare’.

Coated metal simply needs a wipe with a quick detailing spray and a soft microfibre cloth (lint-free if the metal finish is textured or rough). Bare metal should either be treated in the same way, or if there is a risk of rusting (perhaps because the chrome plating is old or pitted) then it should be lightly oiled with a suitable product ('3-in-1' oil or a water-displacing spray), applied with a soft, lint-free microfibre.

INTERIOR GLASS AND MIRRORS

Like exterior glass and mirrors, interior glass surfaces can be maintained simply, using a glass-cleaning spray and a waffle-weave microfibre cloth. Alternatively, glass polish or cleaning creams could be used, but these tend to be very dusty and a liquid abrasivefree glass cleaner should suffice on most occasions. Solvent-based glass cleaners are preferred, because these smear less and often have the best cleaning power.

DECONTAMINATION

There are two main scenarios when it comes to decontamination of interior surfaces. The first is simply when 'spot' contamination needs to be removed (a spilt soft drink, or muddy boots); the second is when the interior surface has reached such a soiled state that it needs a thorough decontamination, perhaps before the vehicle is to be sold, or if it is being restored. In the former case, the cleaning efforts may be focused on a narrow, specific area, perhaps just a few square centimetres of material. In the latter, a wider decontamination will have to be carried out, involving all the material targeted. It may also be beneficial to take certain items of trim off the vehicle, and disassemble the interior where possible, perhaps in terms of removing the seats or door cards: this can help gain access to areas of the interior that would not normally be cleaned, and makes intensive cleaning processes easier to carry out.

Spot decontamination is obviously a quicker and easier process, but wholesale decontamination should not be undertaken lightly.

Allow a day or two for the interior to dry fully if ‘wet’ cleaning techniques are used; and you may need almost a week to fully decontaminate a heavily soiled interior, including time for the interior to be disassembled, for decontamination, for drying and then for reassembly.

SMOOTH AND TEXTURED PLASTIC INTERIOR SURFACES

Smooth plastic surfaces can be decontaminated with a wider range of products than textured plastic surfaces, but the risk of inadvertent visible damage is higher. Very fine-cut abrasive polishes, mediumstrength solvents, APCs, detergents and even fine-grade clay bars could all be used to remove different kinds of contamination, but always start with a mild, non-abrasive cleaning product, such as quick detailing spray. Textured trim is more problematic because abrasive products will leave unsightly residue behind. Clay bars and liquid polishes will both be totally unsuitable, and APCs and detailing spray should be used instead (APC for heavier soiling, detailing spray for lighter contamination).

Always be wary of overspray and drips when applying liquids to hard surfaces; if needs be, spray the product on to a suitable cloth first, then use the cloth as an applicator. Alternatively, ‘mask’ areas of the interior that may be affected by overspray (dashboards and so on) with a large cloth or towel.

LEATHER AND VINYL

‘Leather’ covers a multitude of materials, from modern clearcoated leather cloths to antique aniline hides. With vinyl and clearcoated ‘connollized’ leather finishes, firstly remove loose, grainy or crusty deposits with a short-bristled brush, vacuum, and then attempt to remove underlying contamination with a leather cleaner or APC solutions of ever-increasing strength.

Coated leather-type materials will be more sensitive than vinyl, so save aggressive APC solutions for robust, uncoated vinyls that can take such punishment. If these fail to remove the contamination, try a mildly abrasive polish, then use a fine-grade clay or micro-abrasive ‘magic sponge’ (assuming the surface can resist inadvertent damage).

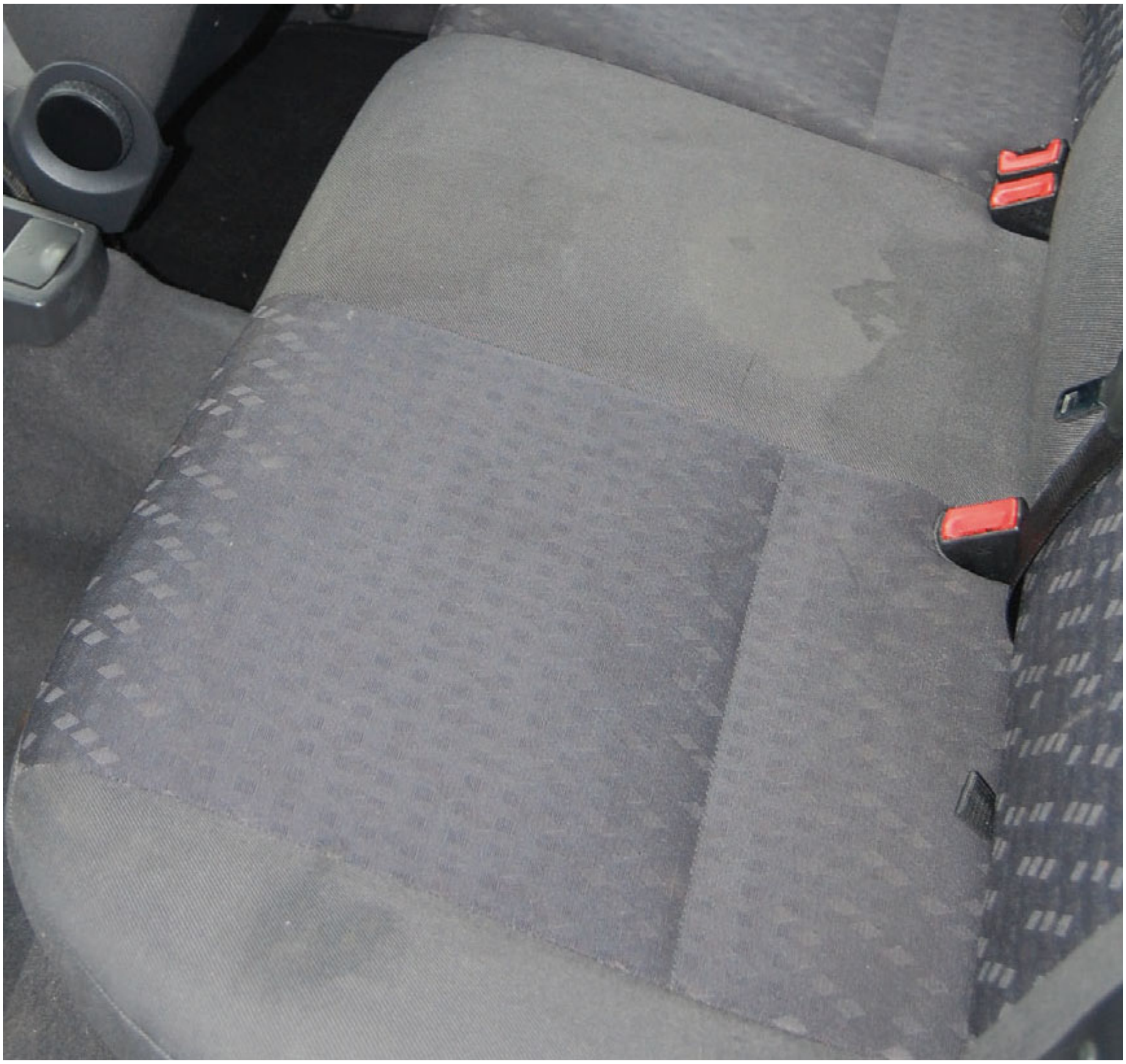
Note that dull, flaked or worn patches caused by the clearcoat or colourcoat wearing away will be due to a lack of finish, not contamination stuck to a healthy underlying finish, so decontamination techniques will be of no use whatsoever. If contamination remains after regular and abrasive cleaning processes, recoating the leather will be the only option.

If the leather is aniline (real hide, dyed all the way through) and in good condition, a mild decontamination regime is required to prevent any protective oils or waxes being removed, and to prevent damage to the colour or structure of the hide. After brushing off loose dirt, use a mild soap (car shampoo will suffice) and water solution, or a mild APC solution for greasier contamination, and work it into the hide with a soft-bristled brush. Nailbrushes may work well, but ensure they are not too aggressive on more delicate finishes. Don’t use strong APC solutions or strong solvents. You may find that a hot towel or cloth (soaked in hot water and then wrung out) draped on the leather for five to ten minutes beforehand helps to ‘open the pores’ of the hide and soften any dirt deposits, before you start cleaning with soap and water.

Contamination that remains after this process has probably stained or discoloured the leather permanently; you could risk removing it with an abrasive ‘magic sponge’, scouring powders or solvents, but peripheral damage may occur. It may be worth leaving it as part of the natural ‘patina’ of the hide, or getting it professionally repaired/recoloured.

FABRIC UPHOLSTERY AND TRIM (INCLUDING HEADLINING)

Wet- or steam-cleaning of fabric upholstery and trim will be the most effective way of decontaminating large areas or whole sections. For smaller marks and isolated decontamination, ‘spot’ cleaning methods should be used – simply ensure that any loose contamination has been brushed off and that the area has been vacuum cleaned, then use an APC spray or fabric cleaner with a damp cloth (of a light colour to prevent dye transfer), sponge or soft-bristled brush to remove the mark; remember to rinse the sponge or cloth regularly to avoid re-contaminating the material.



Water marks ('tide marks') are a hazard of cleaning fabrics with water or liquid products; working in sections and up to seams can help avoid them.

If a stain, discoloration or water mark remains, a wider area may need to be decontaminated. For these larger sections, use a wet vacuum cleaner or steam cleaner. It will be necessary to tackle whole sections at a time to prevent visible water marks (or 'tide marks') when the cleaning process has been completed, so work up to a natural fold, crease or stitching line; it is also a very damp process, so the car doors will need to be opened, clean towels deployed to soak up as much dampness as possible, a dehumidifier (or hair dryer/hot air gun on a low setting) used afterwards, or the car heater system utilized – and even then it may not be possible to sit on the seats for many hours, if these have been cleaned. For cars cleaned in a garage, open all the windows and allow the interior to dry for at least twenty-four hours.

Never saturate headlinings as they could sag if they become too wet; foam-type cleaners may be 'drier' in use and also less likely to create water marks. If using a wet vacuum cleaner, remember to use an APC solution in the wet vacuum cleaner for maximum cleaning effect, and be careful around small items of trim and when near the headlining; the metal blade on the cleaning tool can be sharp, and a certain amount of pressure is required for the recirculation system to work. Never use the wet vac for the headlining itself as it will be too loose; simply apply the cleaning solution using a wrung-out sponge or microfibre cloth (damp, not soaking), ensuring it is both clean and colour fast. If you have access to a steam cleaner, you may find this perfectly suited to cleaning the headlining, though take care not to saturate the headlining, and be aware that too much water trapped behind the headlining could cause any wire supports in its frame to rust.

SPILLAGES – DON'T CRY OVER SPILT MILK

Should a spillage occur on a textile surface, whether protected or not, it should be removed with absorbent towels (paper towels often make the most sense) as soon as possible. Even protected fabrics may eventually be overcome by a spillage, and often the sealant just 'buys time' rather than protecting against contaminants for ever. In some cases, absorbent powders or granules may help (for example, salt or silica gel). Once the bulk of the contaminant has been removed, it could be prudent to 're-wet' the area with either water or solvent to dilute the remaining spillage and prevent tide marks. This may be counter-productive, so care should be taken, but in many circumstances it will help flush out the stain. Drying, then re-wetting the area with clean water or solvent, as a repetitive process, should eliminate the contamination completely. In ideal circumstances, a wet vacuum cleaner should be used on the surface immediately afterwards as a final clean and to help guard against water marks.

Remember, if you don't completely remove a contaminant such as milk (as mentioned in the title), the bacteria that break it down will create obnoxious odours that even air fresheners will struggle to neutralize. If you feel that you have removed the spillage fully, but unpleasant smells are still in evidence, use a 'fogger' can to deodorize the cabin.

CARPETS AND FLOORMATS

Carpets and floormats will invariably have a lot of loose dirt and debris in their pile, and will probably be the most heavily contaminated part of the interior. Floormats need to be removed and beaten or shaken, before being treated further. Then the floormats and carpet need to be brushed with a stiff-bristled brush to loosen any remaining dirt, before being dry vacuumed. Next, use a steam cleaner or wet vacuum cleaner and APC solution to deep clean the carpets and floormats (treat the floormats on a large, clean piece of cardboard outside the car, if at all possible), working the cleaning nozzle in straight lines (if a striped finish is desired, alternating the direction will brush the pile in opposing ways).

Note that strong APC solutions may bleach or fade dark-coloured organic materials (such as wool carpets), although most carpets will be made from a resilient (inorganic) polyester.

After this general decontamination process, any remaining marks should either be 'spot' contamination, or wear patches. Wear patches can be repaired or recoloured, but spot contamination can often be successfully removed without damaging the tough carpet/floormat material. Oil-based stains – as from grease, lubricating fluids or marker pens – can be removed with a solvent and a stiff-bristled brush or lint-free colour-fast cloth, worked in alternating clockwise and anti-clockwise directions to maximize product penetration and cleaning effect. Use a mild APC solution after the solvent, to ensure that the area is clean and that solvent traces have been removed.

If chewing gum is encountered, freeze the gum for five minutes using an ice cube contained in a small freezer bag; this will make it easier to pick or scrape off (use a palette knife or other bladed scraper). It should then be possible to remove any residue with a solvent in the usual manner.

WOOD TRIM

If the wood trim is lacquered or clearcoated, then the usual paint decontamination techniques can be used, from the isolated use of fine-grade clay bars (heavier-grade clays are likely to mar the finish) and fine- or medium-grade polishes to strong APC and solvent solutions. If the wood is ‘natural’ and merely finished with a wood stain, then it can be washed with a mild detergent solution. Should contamination remain, it can be sanded down with fine-grade abrasive wet-and-dry papers and re-stained – though note that oil-based blemishes (such as marker pen) may have sunk deep into the grain of the wood and it might prove too destructive to totally remove them. Always finish any sanding process with the finest grade abrasive paper available, and re-seal the wood afterwards with a stain or wax.

METAL FINISHES

Bare metal finishes can usually cope with aggressive decontamination techniques, with metal polishes of various grades being the recommended product choice. Strong APCs should be avoided because their caustic nature can discolour many metal finishes if left to dwell. Fine- and medium-grade clay bars can also be used on most metals, with heavy-grade clays suitable for decontamination of the hardest metal finishes – although it is unlikely that clays can be used freely inside a vehicle (small spot decontamination with a clay bar and lube or quick detailing spray could be possible, using a towel underneath the working area if necessary).

With most interior metal finishes, though, a quick detailer will remove most of the contamination, and a fine-grade metal polish should take care of the rest. Remember that many ‘metal’ finishes will actually be metal-effect paint, clearcoated metal or a thin metal veneer, and an even gentler decontamination approach may therefore be needed (a quick detailing spray and soft cloth being adequate for the job).

INTERIOR GLASS AND MIRRORS

If the use of a strong glass-cleaning spray (solventbased) does not shift contamination on glass, there are three additional decontamination processes that can be employed. Firstly, try an abrasive glass polish – these are usually opaque, white in colour, and can be quite dusty in use. If applying a glass-sealant/antifogging agent afterwards, ensure the polish is ‘residue free’ without sealants or other water-repellent ingredients (these may inhibit bonding). Next, clay bars can be utilized. Glass (assuming it is not tinted) can take high levels of abrasion before marring, so whilst it is always sensible to start cautiously with a fine-grade clay, heavier-grade clays can usually be used without endangering the glass.

If contamination remains, care must now be taken – it is likely that the marks will actually be etched, scratched or welded into the glass itself and further attempts at removal could potentially damage the glass. Cerium oxide glass polish would typically be used, with the correct abrasive-fibre machine-polishing pads (perhaps using a drill-bit attachment), but this can be a messy process and any polishing particles that meet other interior surfaces are likely to scratch them when removal of the residue is attempted; also note that metal particles soldered to the glass during the welding of, for example, interior roll cages, will be very difficult to remove and polishing will be unsuitable. These should be picked or sliced off with a de-nibbing tool and then the underlying area polished with cerium oxide;

however, given the effort involved and the corresponding risks, it is often easier and more economical to simply replace the glass (or live with the contamination).

ENHANCEMENT AND PROTECTION

Interior surfaces arguably need less enhancement and protection than exterior surfaces, because they simply aren't subjected to the same amount, variety and strength of contaminants. Their enhancement and protection should not be overlooked, however. Protecting a dashboard can help prevent it fading, carpet protectants may limit stains if a spillage occurs, and enhancement of all interior surfaces will improve the vehicle's overall appearance.

SMOOTH AND TEXTURED PLASTIC INTERIOR SURFACES

A panoply of trim products exists for enhancing and protecting interior plastics. At one end of the scale is the humble detailing spray, perhaps offering a mild satin finish at most, and little protection. At the other extreme are resin and nano-ceramic trim sealants, giving far superior protection and with the potential to alter the finish dramatically and semi-permanently. Between these poles is a multitude of silicone dressings and sealants, most of which are cheap and effective to use, and capable of giving a good finish quickly, with minimal effort. Just make sure that you never use abrasive polishes on textured trim, so beware any product that seems to 'multi-task' and offers deep cleaning as well as enhancement/protection – it may leave unsightly residues behind.

Which product is chosen depends on whether protection is required, what kind of finish is desired, the nature of the plastic trim, budget, the time available for application and the skill of the user. As long as the trim is in good condition, clean and dry, and the application cloth or sponge is absorbent and lint free, there should be little preventing successful application. Patchiness and an inconsistent finish are more likely with old UV-damaged or faded plastic trim pieces – usually dashboard top surfaces – so have realistic expectations about what can be achieved if working on a classic car.

Note that many trim dressings can be very greasy, and there is a high risk of over-application; applying products thinly and buffing ‘dry’ with a second cloth are both recommended – a ‘blotting’ action can prove effective at preventing streaks on smooth plastic finishes. Also, be very cautious of ‘high sheen’ dressings or sealants used on the dashboard: these can cause intrusive and distracting reflections in the windscreen when driving, especially on sunny days. A ‘satin’ or low sheen dressing would be more suitable for this purpose.

LEATHER AND VINYL

Leather sealants that cure to a 'dry' finish are recommended for all modern coated leather finishes; traditional leather creams that 'feed' or 'nourish' leather only work on older aniline leathers and will simply sit on top of coated leather rather than being absorbed into it.

Vinyl needs less enhancement and protection in comparison to leather, yet a trim dressing or sealant may still yield good results. Leather, on the other hand, needs more scrutiny. Aniline leathers (traditional natural hides, dyed all the way through) will be oiled and waxed. Clearcoated leathers, however, need a different approach: these should be treated like paintwork, and the use of 'dry' sealants would be required. It is therefore important to identify the type of leather before enhancement or protection commences; oiling and waxing coated leather will increase the chance of dye transfer from jeans, for example, and may also attract dirt and granular contamination – in other words, the unabsorbed oil or wax could become a mild abrasive paste that will erode the clearcoat or colourcoat of the leather with unfavourable long-term results. It is also worth considering whether finish is more important than protection, or vice versa, and what kind of finish is desired.

For natural leathers, ensure the surface is clean, then apply a leather oil, glaze or wax to the finish and work it into the grain using a sponge or robust lint-free cloth; some feel that a hot, damp cloth may open pores in the leather beforehand, allowing the oils or wax to seep deeper into the hide. Excess oil should be removed with a lint-free cloth, and any wax should be buffed to a high shine after its natural curing time. Multiple coats of wax may increase protection and should be undertaken at least an hour apart. Finally, a leather sealant could be applied to 'lock in' the finish and increase protection, although some detailers feel that this may prevent the leather from 'breathing'. However, in most cases this is an incorrect assumption, because aniline leathers can often 'breathe' from their underside – but sealing leather in this way may prevent excess oils from evaporating or wax solvents from outgassing, so there could be a small benefit in leaving the leather oiled or waxed but unsealed.

Note that if a sealant is used, it may have reduced longevity due to being applied over oil or wax; sealants will last longer when applied to 'dry' solventwiped finishes.

FEEDING LEATHER: MYTHS AND REALITIES

You would never dream of applying a non-buffing cream or oil to exterior paint and then leaving it to dwell, but this is what happens when leather 'foods' and creams are applied to modern coated leathers.

A general ignorance of modern leather finishes has perpetuated a common belief that leather can be 'fed', 'conditioned' or 'nourished'. The reality is that whilst old aniline leathers (genuine hide, dyed all the way through) can be kept supple with oils, modern leather can be no more 'fed' than paint on the exterior bodywork of a car. This is because the pigments in the paint – or the clear varnish particles in the 'lacquer' or clearcoat – seal the leather totally with an oil and waterproof layer (assuming the underlying material is, in fact, leather: it could be some form of leather cloth or 'faux' leather made from vinyl, rather than natural hide). If you could 'feed' paint, all car manufacturers would be recommending such a process, but all you can do to protect paint is to use waxes or sealants to help inhibit damage from the elements and UV light, and if it has become damaged you may be able to restore its finish temporarily by flooding it with glaze oils. Of course, this ‘leather’ paint is on a flexible material, not static bodywork panels, and some may argue that this means that there may be some benefit in ‘feeding’ it. . . surely the flexibility can be maintained or rejuvenated if enough product is left to soak into the clearcoat?

Unfortunately, whilst further degradation may be prevented, existing damage cannot be permanently repaired without recoating the leather properly – when the ‘nourishing’ oils evaporate, the surface will be as cracked, brittle and rough as it was before.

So what of natural leathers? Well, these hides can become dry and cracked if they lose all internal moisture. Oils and waxes help keep moisture in, and prevent the moisture evaporating ‘out’. The oils may also soak fully into the hide and keep it lubricated and supple in a similar way to natural greases and dermal oils. These make little or no difference to synthetic ‘faux leather’ or vinyl, however, if they could actually pass through the outer colour/clear coat(s).

FABRIC UPHOLSTERY AND TRIM (INCLUDING HEADLINING)

Fabric sealants can make materials almost completely waterproof, as shown by these water beads sitting on the surface.

Once fabric is clean, there is little that can be done to ‘enhance’ it, other than by aligning the pile with a short-bristle brush if it is a deeper-piled material. However, it can be protected. There are some very effective fabric and upholstery sealants on the market, with perhaps the best known being 3M’s ‘Scotchguard’. These make the material resistant to water- or oil-based contaminants (or both); oleophobic (oil-hating) coatings are good at resisting dye stains from denim jeans, for example. Typically, you would spray a fabric sealant on to the fibres, and this will certainly give the most consistent finish. A large number of light coats is desirable; a single coat will rarely coat anything but the tips of the fibres, and will be easily overcome by a spillage.

The alternative is to brush, dab or roller a much wetter coating of sealant on to the fabric. This will use a lot more sealant and could affect the finish and even the bonding of the fabric to any backing, so should be undertaken with caution. But saturating the fabric in a spray sealant will make it virtually impenetrable to most liquids.

Note that spray sealants should be seen as products that ‘minimize’ rather than ‘fully prevent’ contamination; even if sealants are heavily applied, if the fabric is exposed to a liquid for a sustained period, the liquid may eventually defeat the sealant and the fabric will become wet or stained. Sealants are therefore ‘buying time’ in that they will prevent a liquid contaminant immediately entering the structure of the fabric, keeping it on the surface where it can be mopped up or removed more easily before serious contamination can occur.

Finally, note that seats can be protected from ‘high soil’ situations – for example, when children are eating in the car, dogs are transported after a walk, or rubbish is being taken to the tip – using seat covers. These covers rarely look good and may be slippery or ill-fitting, but they are supremely practical in certain situations and can prevent the original seat material from becoming contaminated or damaged.

CARPETS AND FLOORMATS

With carpets, an enhanced finish can be created by vacuuming or brushing the pile in opposite directions; however, protecting the carpet with a fabric sealant may prove more beneficial, especially if the carpet is a lighter colour.

The visual appearance of carpets and floormats may be enhanced by brushing or dry/wet vacuum cleaning them in stripes (so the pile lies in opposing directions), but protection is a far more likely, and productive, course of action. Specialist sealants of the same nature as mentioned above for fabric and upholstery will be of use. Once again, multiple ‘light’ spray applications should be undertaken (having thoroughly cleaned the carpets and floormats), with the floormats treated outside the car to avoid the dangers of overspray and fumes. Darker-coloured carpets could be saturated with a sealant to even greater effect by applying the sealant with a brush, sponge or small paint roller, but this could be a very costly exercise because two to three times the amount of sealant is likely to be used compared to light spray applications.

Ultimately, carpets and floormats tend to be made from tough, stain-resistant acrylic/polypropylene synthetic materials that inherently resist contamination/absorption compared to natural materials, and therefore require little additional protection. Some cars, however, have wool carpets or floormats (such as luxury cars and classic cars), and these may certainly warrant higher levels of protection (if they remain unaffected by the process: some sealants contain strong solvents that could attack natural dyes). Reapply sealants at the recommended intervals to ensure they remain effective; an annual application is likely to be necessary. Having applied them when the car is new, don't then assume that they will be active for ever.

WOOD TRIM

Varnished or clearcoated wood can be enhanced and protected in the same way as exterior paintwork, or interior plastic trim. A little quick detailing spray, trim dressing or wax/sealant should increase gloss, potentially fill minor scratches or marring, and even provide some protection – although interior wood is more likely to suffer from inadvertent scratch damage from car occupants than from damage caused by environmental contaminants, and that could be difficult to guard against unless paint protection film is employed.

'Bare' wood with a natural, stained or waxed finish can be enhanced and protected in the most traditional ways: by lightly oiling with teak oil, linseed oil or similar wood oil, then buffing with a lint-free cloth (to enhance the finish); by using a stain or varnish if currently unfinished, for more permanent enhancement or protection; or by using a beeswax furniture wax (or similar wood wax) to re-wax a finish or provide a fresh layer of protection to unfinished wood.

Wood wax can fill minor scratches, recolour the finish, increase gloss, and give a modicum of protection; it can even be layered far more successfully than when applied to paint, because wood is a more absorbent material with a rougher (microscopic) surface texture.

Some classic cars may have a 'French polished' wood finish that has a similar appearance to lacquered or waxed wood; this is created by applying shellac – a natural resin – in combination with certain oils in multiple layers, and is a very specialist finish. Use a mild water-based detailing spray to maintain it, and consider seeking professional assistance if the finish needs to be rejuvenated or repaired.

METAL FINISHES

Specialist metal protectants do exist, but their effectiveness and longevity is limited by the dense, smooth metal surface and any residual oils left behind from the polishing process. These both inhibit adhesion of the product to the metal surface.

There are many ‘plastic chrome’, metal veneer and clearcoated metal finishes used for automotive applications, so ensure that you are dealing with ‘bare’ metal before proceeding; plastic or clearcoated finishes can be enhanced and protected in a similar way to exterior paint or plastic trim. Enhancing a bare metal finish, on the other hand, is far more rewarding: rarely can you create such a lustre, so quickly, as when bare metal is polished to a mirror shine. Note before you start that the result could be so dramatic that you will need to survey the scale of the job ahead: so mirror polishing a small section of metal may be quick and effective, but creating the same finish on the bare metal floorpan of a racing car may prove time-consuming beyond belief. The type of metal to be enhanced will dictate the metal polish and tools required for the process. Soft metals need gentler polishes and techniques, although a rough waffle-weave microfibre cloth and a fine- to mediumgrade metal polish will usually work sufficiently well (and safely) if you are unsure of the metal type.

Protecting metal finishes is less common, and the results are less obvious. High-temperature paste waxes and paint sealants may afford some protection, and specialist metal sealants do exist, but interior metals rarely need a large amount of protection anyway. Slick polymer sealants may be oleophobic enough to limit fingerprint marks on stainless steel, and paint protection film could even be used to protect extremely delicate components. Remember that highly polished metal surfaces tend to reduce product longevity by compromising bonding, so expectations should be subdued – and always use a solvent to wipe down the metal surface before application, to remove any oils left over from previous polishing processes. Etch priming and then painting metal surfaces, or powdercoating them, offers superior protection but obviously suits exterior components rather than interior trim.

INTERIOR GLASS AND MIRRORS

Unless referring to the application of an anti-fogging agent or window-tint spray/film, interior glass doesn't need any enhancement after it has been cleaned or decontaminated. It can theoretically be protected by a glass sealant, of course, with 'covalent silane' nano-technology products amongst the best in class. These bond to clean glass at a molecular level and therefore offer unparalleled longevity, although it should be noted that there is rarely any need for such protection on interior glass surfaces, and applying a sealant of this nature would be highly unusual, even within the realm of expert detailing. Interior glass simply doesn't get as wet or contaminated as exterior windows or mirrors, which is where glass sealants really come into their own (although a glass sealant on interior glass may help minimize fingerprints).

SURFACE RESTORATION (RECTIFYING DEFECTS AND IMPERFECTIONS)

Interior surfaces are rarely coated, making them difficult to repair or rejuvenate compared to painted exterior surfaces. Scratches and scuffs to hard plastics, tears to fabric, and worn sections of carpet all defy simple and easy rectification, and it may be necessary to replace some of a section or all of it. The main exception will be modern leather finishes – these are often coated and could therefore be suitable candidates for restoration.

SMOOTH AND TEXTURED PLASTIC INTERIOR SURFACES

If a plastic component is uncoated and gets scratched, scuffed or damaged, there is little chance of repairing it without compromising the original finish. Any attempt to sand or melt the surface could be painfully obvious, and filling the scratches with glaze oils or waxes will be a temporary fix at best. If improving the appearance is not possible with a ‘magic sponge’ (a mildly abrasive sponge often found in homeware stores) or fine-grade wet-and-dry paper, it may be simpler to replace the component (if this is cost effective and relatively easy to do). Or if it is a smooth-finished part, use a plastic repair resin to fill the defect before sanding the surface down and recoating it with a paint that matches the original finish as closely as possible.

Textured finishes can sometimes be repaired with a putty or resin, before a similar texture is imprinted into the surface prior to repainting – although the result will rarely be perfect.

LEATHER AND VINYL

Modern leathers can be repaired or rejuvenated by re-coating them using flexible paints and clearcoats. Aniline leathers may not be so easy to repair.

Vinyl, like plastic surfaces, can be difficult to repair if it is damaged, unless the marring can be filled with a flexible material and then sympathetically recoated. Aniline leather is also unforgiving. Being natural hide, scratches and tears will be obvious. However, there are a number of options if the surface has been broken. Firstly, you could try ‘steaming out’ minor scratches using a damp cloth and hot iron – the steam acting on the section for a few seconds can help the scratch to swell and become less visible (or even to be removed entirely) – although this won't work on scuffs and tears. Secondly, the whole section of leather could be replaced, although this can be expensive and time-consuming, plus there is no guarantee that the new panel will match the worn sections. Thirdly, the damage could be glued, stitched or patched, although the repair is likely to be noticeable.

Finally, in extreme cases, it could even be worth repairing the leather and then 'converting' it to a 'semi-aniline' finish, with a coloured top coat – although whole areas will need to be coated, far beyond the damaged section, to ensure a consistent finish.

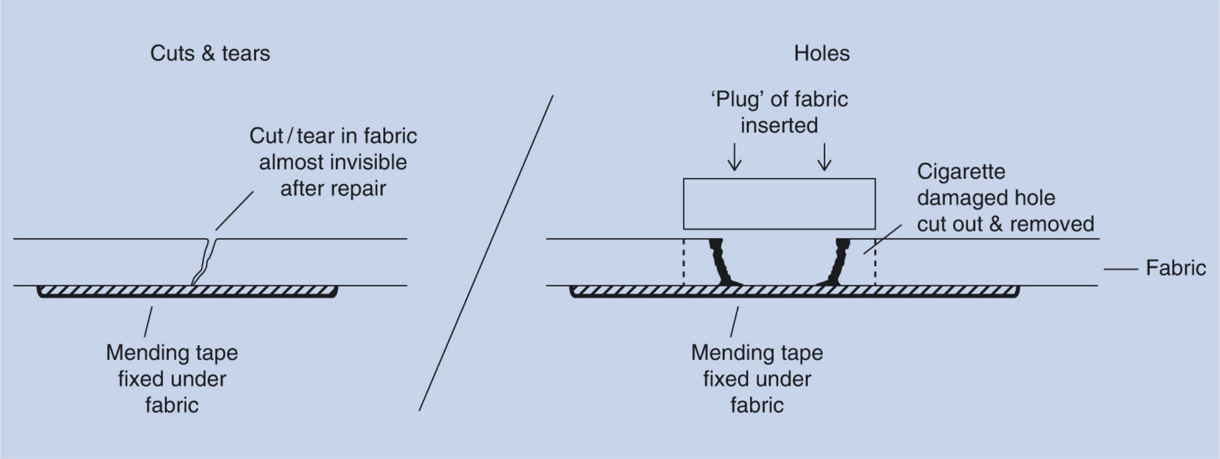
Coated leather is easier to repair in many respects, because as long as a good match can be made in terms of coating colour, it can be cleaned/sanded before defects are filled with gauze, paste fillers or gels (textured if necessary) and then recoated. And if the colour coat has worn off and the surface is undamaged, the process is even more straightforward: clean the surface thoroughly, key it if required, and then apply a number of colour coats (with perhaps a clearcoat to finish). The most common application method will be by sponge, dabbing the colour on, but the best finishes will be sprayed on by airbrush/paint gun.

FABRIC UPHOLSTERY AND TRIM (INCLUDING HEADLINING)

Damaged upholstery will invariably be torn and require stitching, gluing or patching. 'Invisible' mending methods, where the material is repaired from its underside with a glue-backed patch, are perhaps the most unobtrusive, but the fabric will need to be removed from the component in most instances (or access gained to the underside via other means). Cigarette burn holes may even be cleaned up with a sharp scalpel and repaired by fitment of a small insert, flush to the material surface (sitting on the mending layer beneath). Cigarette burn kits made specifically for this task are available and even allow the colour and texture of the fabric to be reasonably recreated to ensure an adequate repair.

Stitching and gluing fabric from the upper surface will be more unsightly and therefore unsuitable in most instances. Replacement of the fabric section with a perfect piece will be ideal, but this is likely to be fiddly and potentially expensive; in extreme cases it may simply be more practical to replace the whole component.

CARPETS AND FLOORMATS



Cuts & tears
Cut / tear in fabric almost invisible after repair
Mending tape fixed under fabric
Holes
'Plug' of fabric inserted
Cigarette damaged hole cut out & removed
Fabric
Mending tape fixed under fabric

Invisible mending on fabric.

Compared to fabric covering seats or trim panels, carpets and floormats can be much more forgiving to repair. Not only are they much thicker, with a deeper pile, but they tend to be dark in colour and are either easy to remove (in the case of floormats) or relatively unobtrusive (carpets). Repairs can therefore be carried out with far more ease and success.

For tears or cuts, a thin repair patch can be glued to the underside of the carpet, and the tear or cut will be almost invisible if the pile is deep enough. For cigarette burns or moderate sized holes and other damage, clean cuts can be made with a scalpel to remove the section; this will act as a template for a new piece (to be inserted in its place by gluing it onto a thin backing section that covers the hole and surrounding area from underneath; although if the carpet is glued down then a backing section may not be necessary and glue may suffice).

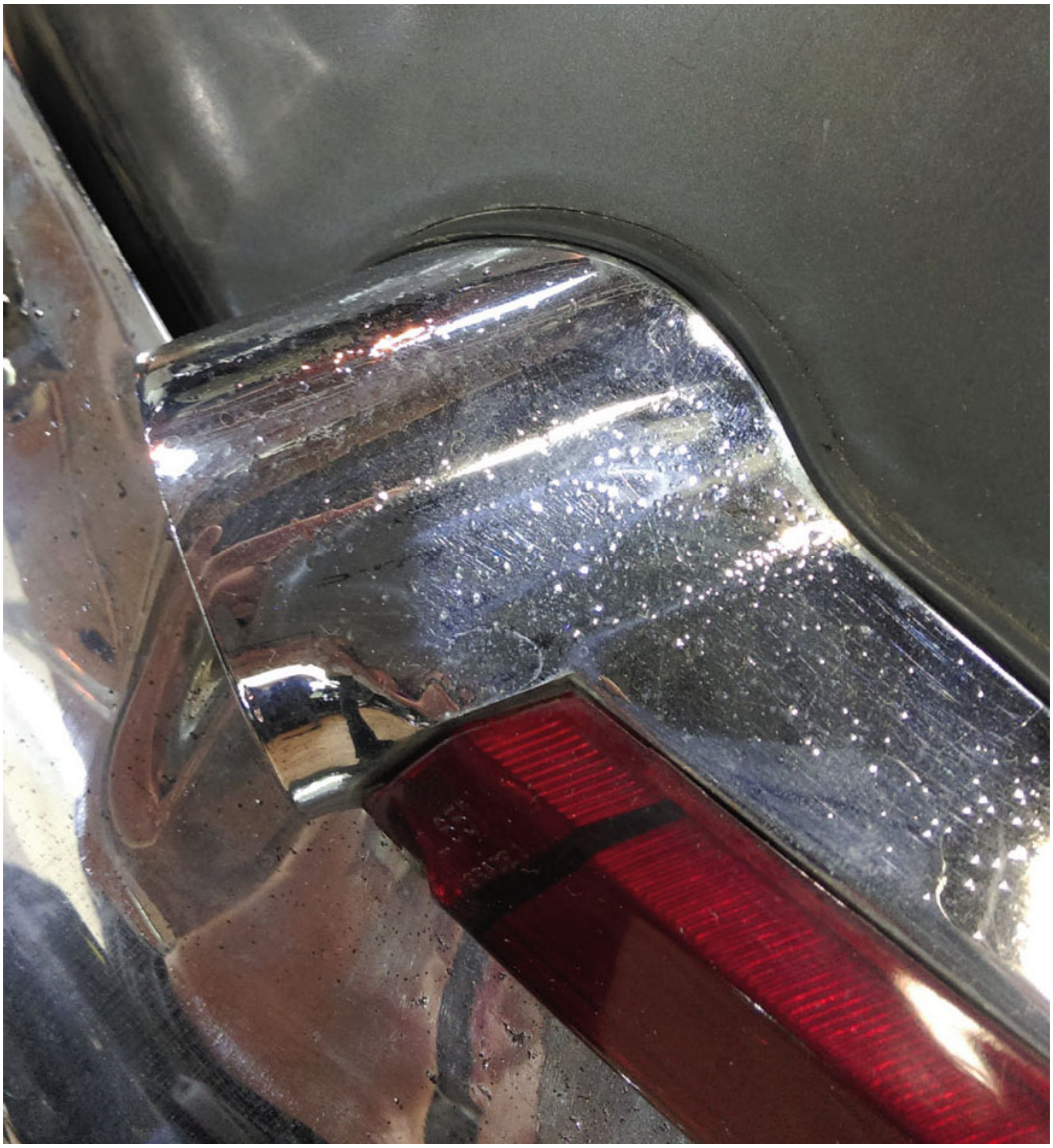
For more extensive damage, perhaps caused by mould, sun damage or spilled battery acid, replacing the floormats or carpet entirely may be a more sensible course of action. Classic cars that have faded carpets in otherwise fair condition may benefit from the original carpet being retained, but re-coloured with a suitable dye. On commercial vehicles with black carpet, paint stains (or other instances of discoloration) are sometimes repaired using black spray paint, but this method is less than ideal, not least because coverage is likely to be incomplete, the finish inconsistent, the process messy and unpleasant, and overspray inevitable. It should therefore be avoided by valeters and detailers in the majority of circumstances.

WOOD TRIM

Coated wood that has been lightly scratched can often be restored using traditional paint renovation techniques – polishing or light sanding, followed by the addition of lacquer or wax. Deeper scratches that have breached the coating layer may require careful wood filling, then the application of a top coat of lacquer – although the repair may still be visible and replacement of the trim piece could have been a better option.

Damage to uncoated wood is arguably easier to deal with; one of the main benefits of wood as a material is that it can be shaped, sanded, filled and stained back to a near-original finish. Light scratching or marring can simply be sanded back with fine-grade steel wool or sanding paper, then refinished with a stain or wax. Deeper scratching will need more intensive sanding, before refinement and refinishing. If gouging or chipping has occurred, wood filler can be used to build up the wood surface to the requisite height, before it is sanded flat – although the stain or wax will rarely ‘hide’ the repair totally, and it may still be evident afterwards.

METAL FINISHES



Chrome bubbles or spots are a sign of underlying corrosion, usually a pin prick of rust beneath the plating. This is often due to poor preparation, poor process, or a thin chrome coating. The rust spots can be tackled in isolation, but it is sometimes quicker and easier to re-chrome the whole component.

Uncoated metal finishes can be honed with specialist metal polishes if they are scratched, until a mirrorlike reflection is achieved. Care should be taken with plated finishes, however, because aggressive polishing could expose the base metal or sub-plating beneath. Deep gouges in metal can often be filled with solder or even a repair putty, but repairs may be obvious and (in some cases) short-lived. Of more concern will be rust, perhaps in the form of tiny spots appearing in a chrome finish. These nibs of rust need to be exposed through rubbing down with fine-grade wet-and-dry paper or wire wool, treated with a rust converter, and then coated to prevent them re-rusting. In practice, re-chroming the entire component may be more effective, being both cosmetically favourable and potentially less timeconsuming (the entire chrome finish would usually require substantial re-polishing if rubbed down to remove raised rust spots).

Luckily, rust and scratches are rarer inside the car than out, and most modern metal finishes will be thin metal veneers or coated/plastic trim, largely removing the need for aggressive metal restoration techniques. Also, replacement of seriously damaged components will always remain a viable option given the likelihood of trim pieces being smaller and more easily removable/accessible. Restoring interior metal finishes therefore tends to be quicker, simpler and less daunting than restoring a vehicle's exterior metal surfaces.

INTERIOR GLASS AND MIRRORS

Whilst interior glass can be heavily cut to remove scratches and other defects, it would be almost impossible to achieve this within the interior of a vehicle. Cerium oxide, a glass abrasive frequently used for aggressive polishing, could sling, stain and create a blanket of dust if used on the interior. It is a far more sensible course of action to remove the glass, should it be severely scratched, and polish it outside the car – and replacement of the entire glass unit could even be a viable alternative, if costs are reasonable. Luckily, heavy scratching is rare when it comes to interior glass surfaces; exterior glass surfaces are far more likely to suffer from this kind of damage.

CHAPTER EIGHT

DETAILING AS A PROFESSION

The headline-grabbing figures supposedly charged by some professional detailers to detail a car – perhaps £5,000 or more – combined with relatively modest set-up costs, has led to an increase in the number of professional valeters and detailers offering ‘high-end’ detailing services. The reality is that headline-grabbing figures may never actually be charged: they could just be dreamt up for publicity purposes. And if those amounts are actually levied on a handful of wealthy customers, the chances are that the work involved reduces the hourly rate to a more modest level. Indeed, completing a ‘posh wash’ in a fixed and short amount of time could be more lucrative than spending a week or two on an engine-out detail of a highly strung supercar when perfection has been promised and timings are less easy to estimate.

There are also far fewer supercars around than regular saloons and hatchbacks, narrowing the market considerably. With a glut of portfolio-pushing detailers chasing a handful of suitable vehicles, competition is bound to drag prices down from the stellar levels that could once have been achieved.

It is therefore important to figure out the following:

- The size of the market and whether you will be able to prosper in it, or at least earn enough money initially for your venture to be sustainable

- The competition within that market, because too much of it will surely have an impact on the aforementioned point
- The likely demand for your services initially, and then as you become better established
- The average time taken per vehicle, and the revenue that is likely to be achieved (a healthy pessimism is useful here – don't fall into the trap of overvaluing your services)
- Your foreseeable costs

RESEARCH AND PLANNING

A booming classic car market and the appeal of supercars as portfolio material mean that detailers clamour to look after them. However, there may be easier and richer pickings elsewhere.

Every detailer would like to work on rare supercars, be taken to prestigious concours events by amiable car collectors, and then enjoy a small glass of champagne when their work wins 'Best of Show'. The sad reality is that valeting and detailing is a tough job, being both physically and mentally demanding, and because there are few barriers to entry, competition can be fierce. Instead of working on supercars, you could be removing baby sick from the back seat of an MPV, or desperately persuading the owner of a second-hand executive saloon that there could be some benefit in machine polishing it. Whilst the ambition and enthusiasm to launch into a new career is admirable, a lack of realism is going to be costly. So it is important to bear in mind the provisos described in the sections below.

PHYSICAL AND MENTAL PRESSURE

Ask yourself if you could get the same enjoyment from valeting or detailing that you do when working on your own car, your friends' cars or when working part-time. Full-time valeting and detailing may become wearing, and after the novelty of working on a supercar wears off, you may find that their paintwork is inconsistent, they are difficult to insure and manoeuvre, accidental damage can be costly, and some owners can be tricky to deal with. If you get the same enjoyment from detailing a Ford Fiesta as a Ferrari, can machine polish the last panel as fastidiously as the first, and find that the satisfaction of a 'job well done' ceases to diminish after the thirtieth, or hundred and thirtieth car of the same type, then you will have no issues. But those with a low boredom threshold will struggle.

Physically you will need to deal with backache from using machine polishers, and must consider whether being cold, wet and tired is going to be too much of a discomfort. Detailing is no office job: early starts, freezing conditions and inclement weather all encumber the detailer. And whilst a unit or workshop may improve those conditions, it can't do much for backache. Obviously, some types of valeting and detailing are going to be less strenuous than others, so see what area of the profession suits you, both physically and mentally.

DISCOVER YOUR TRUE MOTIVATION

If money is the driving force behind your detailing ambitions, be very careful. Whilst it is possible to earn a good living from valeting or detailing, it is difficult to become very wealthy. The most lucrative concerns are well established corporate contractors, servicing large numbers of vehicles with an army of staff (moderately paid at best). Single ‘owner-operator’ businesses need to be very busy to pay well, and even the headline-grabbing thousand-pound commissions prove less lucrative than many realize because they simply take too long to complete to be worth their while (although they are great for marketing purposes).

Overall, detailing should be a passion, and not a way to a ‘fast buck’. Passion also tends to show through in the quality of the work, and that is something that can rarely be said when money is the motivation. Good work, done to the highest standards, with fair pricing and excellent customer care should be your business model.

BE WARY OF ASSUMPTIONS

Assumptions are what lead people into business, and often into business failure. Never assume that a lucrative part-time enterprise could be a full-time concern. Sometimes there is enough business to keep your weekends busy, but doubling or tripling the order books, and sustaining that throughout the year, isn’t going to be easy. Never assume that because detailing looks easy, or seems lucrative, that it is. Do you know for sure that a £5,000 detail on a Lamborghini Aventador was actually paid for? Or was it done as a ‘portfolio piece’ for a supercar dealer, at no charge at all? Correcting the paint on your own car may take little more than a day or so, now you know the right pads and compounds to use for correction. But can you correct an unknown vehicle, perhaps with problematic paint, in the time that it is booked in for?

And finally, never assume that the market needs another professional detailer. Ensure that you can offer something different or unusual – the only local detailer with a unit, perhaps, or maybe you specialize in a certain type of vehicle – and if you can’t offer something different or unusual, ensure that you are unusually good.

KNOW YOUR OWN ABILITIES

Every detailer has strengths and weaknesses, so ensure that you always play to your strengths and avoid work that emphasizes your weaknesses. If you struggle to correct paint, or to correct it in a timely fashion, do not promote that service, but concentrate instead on routine washes, hand polishes and waxing. If you do get asked to machine polish paint, you can always quote a higher amount than usual (to thin out demand, or make it worth your while). Fast, accurate work, completed with a high attention to detail, will come naturally if you enjoy the process, whilst operating outside your comfort zone could, conversely, lead to mistakes and ultimately be self-defeating.

UNIT VERSUS MOBILE?

The detailing unit offers the best environment for machine polishing, but it does come at a cost, so check to see if you can afford it (and if you really need it).

One of the first targets that a new pro detailer aims for, is a unit. A unit offers a comfortable working environment away from the ravages and variables of the weather. With a beautiful tool cabinet on one side (with every detailing tool near to hand and in its place) plus some metal halide, LED or daylight strip lights on the walls illuminating the working area, a bespoke workspace has an instant and strong allure. Indeed, machine polishing a car outside may prove troublesome, or even impossible, given the potential for contamination to clean panels and disruption to work caused by the weather.

However, whilst the dream is reasonable, the reality is that a unit is an expensive luxury suitable only for detailers or valeters who machine polish a great deal. Even if unit rent can be agreed at a sensible rate, there will usually be an expensive lease to draw up (perhaps as high as £1,000, charged by a local solicitor), council rates to pay (typically around 40 per cent of the rent, although small business discounts may apply), service, electricity, water and waste charges, plus the invariable cost of making the premises fit for purpose (this includes fire extinguishers, lighting, security, insurance). This means that a small unit could cost £5,000 per year, and a larger unit perhaps two or three times that amount. Without subsidizing the costs by charging for vehicle storage or sub-letting space, this kind of sum may represent a substantial amount of a detailer’s income.

In comparison, offering a mobile service is relatively cost effective and allows a detailer to cover a wide geographical area. A second-hand van with water tank and generator may cost as little as £3,000. However, it does not improve the physical hardships of machine polishing out of doors: a pop-up gazebo may help, but by the time this has been assembled and fully anchored against the effects of strong winds, critical detailing time will have been lost. Note that whilst vans are ideal for mobile detailing and valeting duties, a large car (such as an estate/station wagon) may suffice – though if this is the case, access to a water supply on location will be essential: water tanks rarely fit these smaller vehicles.

Ultimately, if you machine polish every day, then a unit may be worth the investment. If you only machine polish occasionally, ‘borrowing’ premises or hiring them when necessary makes far more financial sense.

ASSESS THE MARKET CAREFULLY

How many detailers or valeters are already operating in your market? What is a customer likely to pay for different types of work? Will you be marketing yourself locally, regionally, nationally – or even internationally? Will you be targeting the small number of supercar owners who may have a potentially higher budget, or the larger number of regular customers driving less exotic machinery who may have a more limited budget? More competition may mean lower prices, and it could be difficult to break into the market or make a good living as a result.

CHOOSE A NICHE

If you don’t have a point of difference, you’ll only be able to compete on price (and this could lower both income and morale, even if it is sustainable). Having a unique name costs nothing and can set you apart from the competition; this should be the first way you differentiate yourself. Next, look to see if you can offer something unusual or different in terms of services – perhaps by specializing in a certain detailing technique, car marque/model or geographical location.

Finally, ensure that the quality of your work and customer care is the best available. Making a point of ‘going further’ than other detailers will rarely go unnoticed and could boost your reputation. In short, be different, be good – and ideally be both.

FORECAST REVENUE AND COSTS

Even if you don’t have a unit or van, you’ll have startup costs and ongoing expenses. Calculate them as realistically as you can. Once you have an idea of costs, work out the potential revenue you could earn. Don’t assume you will be busy every day of the week – you may have only a few customers in the early days of your business, and your prices may have to be set at lower rates initially in order to get established. If potential revenue does not meet the costs you are likely to incur, work out ways of saving money. Forgo the van or unit. Advise customers that they will get a discount if you can use the car-care products found in their garage, rather than ones that you provide. Remember that it is your time and expertise that customers are paying for, not a fancy unit or the car-care products you are using. Find a way of making yourself available at lower cost, and if you are good you will remain busy and in demand.

MAKING THE LEAP

If you judge your detailing venture to be sustainable, there will be a number of practicalities to address for it to become a commercial reality.

SOLE TRADER OR LIMITED COMPANY?

Consider whether you wish to operate as a sole trader or with limited liability. Limited companies have a more professional image and the owner will not be personally liable for settling company debts. However, there is a modest set-up cost for Limited Companies and a small annual fee, as well as some admin (the annual return to Companies House and a Corporation Tax return). Sole trading is the simpler route, but a Limited Company offers more security and prestige for larger, more serious, operations.

VAT REGISTRATION

VAT registration is compulsory for all UK businesses realizing more than a specified turnover per year, currently about £80,000. However, you can voluntarily register for VAT below this threshold, if you wish. Should you be targeting a trade audience, where customers are likely to be VAT registered themselves, it makes sense to register for VAT if you are below the threshold – you will be able to claim back VAT on all purchases, and charging VAT will have little impact on your pricing. If you are selling your services to private customers though, you may be best advised to avoid early registration for VAT because all it will do is load your pricing by 20 per cent (or mean that you earn 20 per cent less); private customers will not usually be able to claim the VAT back.

BANKING AND ACCOUNTING

It is not necessary to have a separate business bank account, but it is advisable; distinguishing between business income and expenditure compared to household spending will make reconciling the business accounts easier, and will also give a better snapshot of the current state of the business. Setting up a business account requires the usual money-laundering criteria to be met (ID checks), and a monthly fee will invariably be charged after any ‘free banking’ period ends. That said, a business account may mean that credit cards can be accepted via merchant services (additional fees will apply), and that business loans or overdrafts could (potentially) become available.

Even before you start trading, it is important to keep good accounts; every receipt related to the business must be filed, and these set-up costs can be set against future revenue, and it may even be possible to reclaim the VAT (if relevant). Failing to keep receipts – or filing them – will surely mean paying more tax than necessary, as well as leading to a false impression regarding the profitability of the business. If needs be, employ an accountant or book-keeper for a few hours per month to keep an eye on the figures and to deal with the accountancy and business administration.

INSURANCE

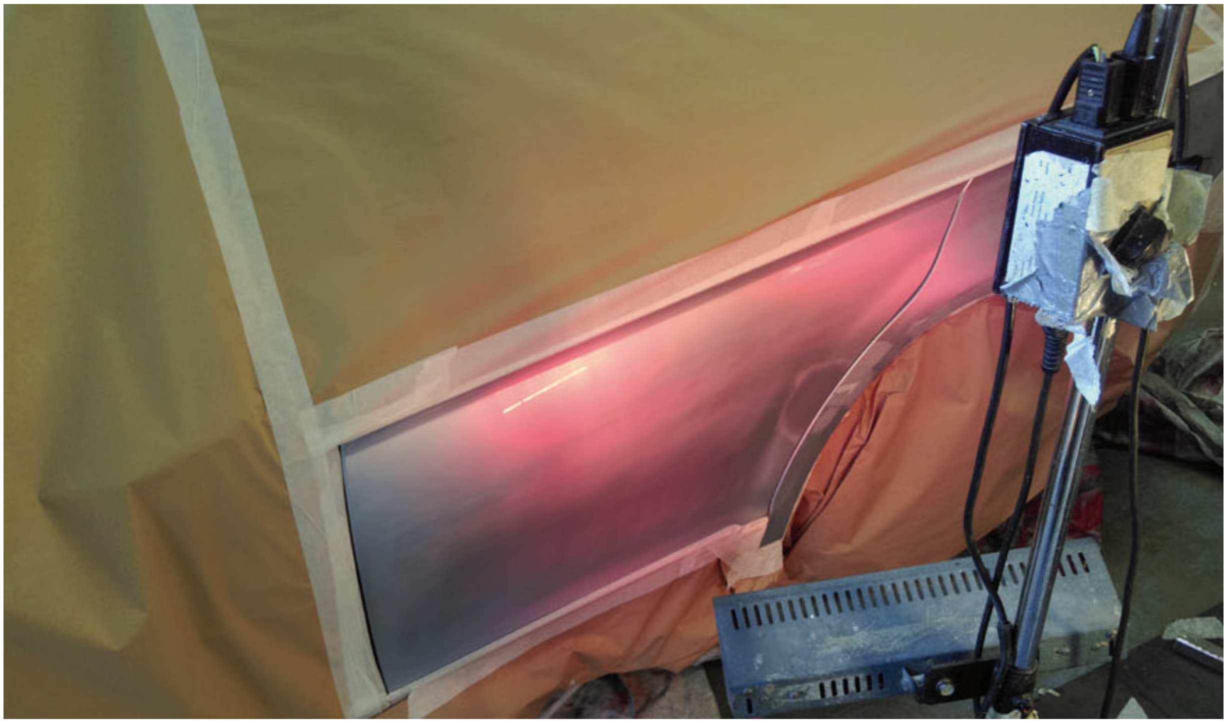
Unless you have employees working for you, the various types of insurance cover available tend to be voluntary, but well advised.

Public Liability

If a member of the public trips over your hose and hurts themselves, you could be personally liable for any claim unless you have adequate insurance cover or a limited company.

This cover insures against claims brought by members of the public, say, if someone was walking past your detailing van and tripped over the pressure washer lead or hose, hurting themselves. If you have a limited company, then a large claim could potentially bankrupt the company if you didn't have public liability cover (but you wouldn't be personally liable). However, this means that sole traders are at far higher risk. Any claims (maybe running into hundreds of thousands or even millions of pounds) could be brought against the business owner personally, rather than the company. You could lose your home, as well as your livelihood and good reputation. Luckily, public liability insurance is modest in fee terms, and a couple of million pounds of cover can usually be purchased annually for just a few hundred pounds (claims are rare).

Accidental Damage/Defective Workmanship



SMART repairs can be a useful technique for repairing damaged paint, but supercar owners may be fussy and insist that their car visits a main dealer-approved bodyshop – at far greater expense.

This covers direct and/or indirect (consequential) loss, if you make a mistake when working on a customer's vehicle. It is important to consider this kind of insurance in these litigious times, for the simple reason that a claim could be brought even if no mistake has actually been made – an accusation, groundless or not, may be enough to start a lawsuit and could be difficult to defend. Direct loss would mean repairing the immediate damage to the vehicle, say, if a panel had been struck through during the process of machine polishing and a respray of that panel (or more of the vehicle) was required. Consequential loss could cover the decrease in value if a respray meant that originality had been compromised, or perhaps loss of enjoyment whilst the vehicle was off the road.

With some classic cars being worth millions of pounds, and originality being paramount, getting fully insured for accidental damage is highly recommended. Remember, supercar owners aren't going to let a SMART repairer or local bodyshop enact a cheap repair if the worst should happen – a vehicle could be taken on a covered transporter back to a factory hundreds of miles away, for a

£30,000 respray. Whilst this type of cover usually costs more than standard public liability insurance, it may be of benefit to any detailer working on particularly valuable vehicles whose owners have the highest standards (and possibly the highest paid lawyers).

Road Risk

This cover is traditional ‘on the road’ insurance, needed for driving a vehicle on the public road (either third party only, when the vehicle isn’t covered but public liability is, or fully comprehensive, when damage to the car will be covered as well). Ensure that the value of the vehicle and excess are carefully considered, and note that this is commercial insurance. Driving a car on your private insurance policy ‘third party’ will not generally cover commercial use, and road risk cover is essential if you are moving customer cars regularly, or picking up/dropping off vehicles, but it is expensive (as a rule). If you can avoid driving customer cars on the road, do so – it not only saves money on insurance, but also prevents customers accusing you of causing accidental damage to their car.

This raises one final point, of course, which is that road risk cover only covers accidental damage rather than mechanical damage – if the engine fails on an expensive car, the owner may pursue a claim against whoever is at the wheel, and standard road risk cover will not pay out. Driving customers’ cars should be carefully considered and the risks should never be underestimated.

Overnight Cover

This is insurance for when a car is kept at a detailer’s premises overnight. Often, the owner’s insurance can suffice. But if the car is valuable, or the period of custody prolonged, specific cover may need to be put in place. If needs be, ask the owner to put insurance in place, or at least get them to notify their insurance company where the car will be residing.

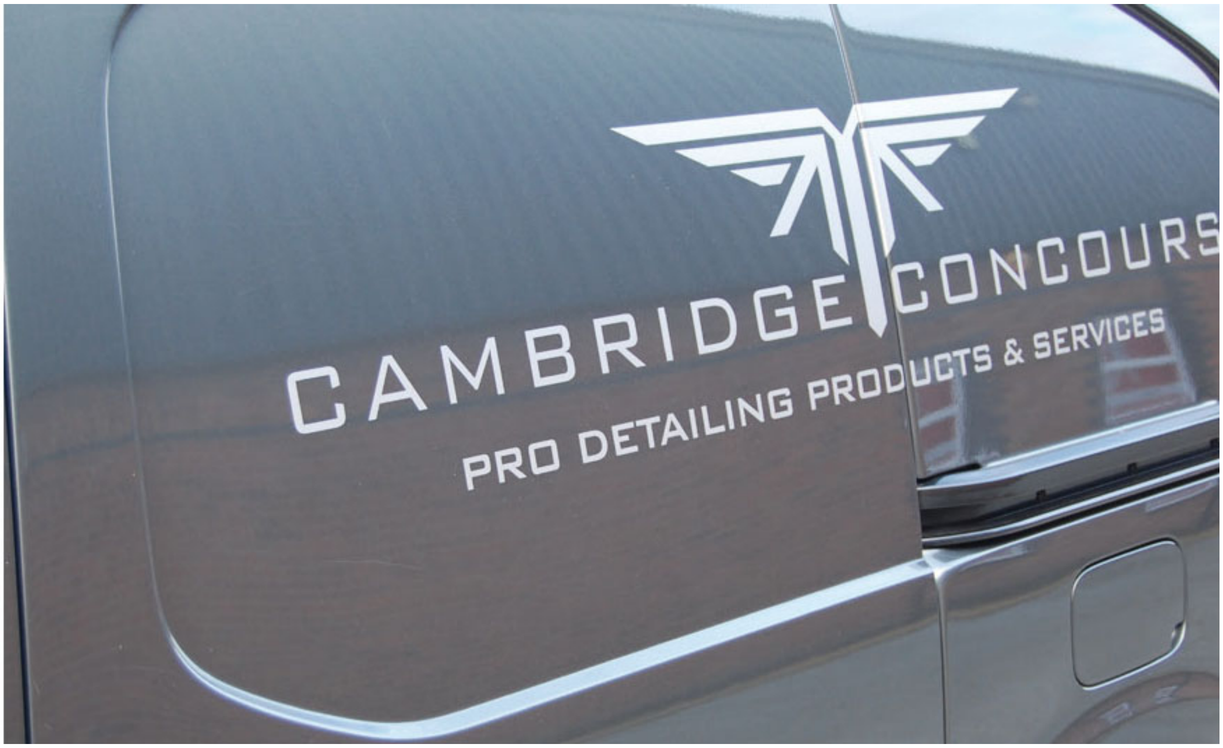
There are even more insurance options available than those mentioned above – such as director’s liability, van insurance, premises contents cover – but a good broker can advise on the options available and their respective costs. One policy should be able to cover everything required, if a tailored approach is taken.

EQUIPMENT

It is a fallacy that you need thousands of pounds worth of equipment to be a successful valeter or detailer; a decent pressure washer and a good machine polisher will be extremely useful, for sure, but customers are paying for your talents and expertise, and not what you have in the van. If you are on a very tight budget, you can even give a discount to customers who let you use their equipment or products, although this can look unprofessional and should not be adopted as a long-term strategy. Invariably you will find that bales of microfibre cloths, premium quality products and assorted cleaning and polishing tools will become important components of your detailing arsenal – but much of the specifics will depend on personal preference and the exact nature of the detailing activities undertaken.

It is more important to establish that a good water supply and electricity will be on hand at the destination, and if not, that the relevant allowances are made. And whilst electricity is useful for driving pressure washers, machine polishers and lights, it is not as critical as water. Detailing a car without on-site electricity means either bringing along a generator or lowering expectations. But detailing a car with a limited water supply can seriously hamper a detail – which is why many professional detailers have vans with in-built water tanks that can hold 200 to 400 litres of water.

BRANDING AND INITIAL MARKETING



Your brand is critical if you want to stand out in a crowded market and make a statement about who you are. Don't waste the opportunity by playing safe and ending up with a forgettable company name and boring identity. This brand is modern and has a memorable visual logo.

The most important aspect of your marketing programme will also be one of the first tasks that you undertake: deciding on your brand. If the brand is right, then all other marketing activity will follow from it naturally and build on the brand's initial appeal. In general terms a brand is the personality of the business, so when choosing a brand, make sure it is distinctive and attractive – or at least as approachable as possible. Simply creating another clichéd and forgettable company name and identity will do you few favours in the long term. It may appear to 'search' well online initially, but there will be so many competitive entries that you will struggle to get value from this approach. Therefore it is suggested you avoid commonly used words or phrases and meaningless initials, and go for something unpredictable or exciting (and therefore memorable) instead. A sub-heading or description can then cover all key words and search items.

Once the brand is established, ensure that it has a good logo (the pictorial representation of the brand). A small conceptual logo, for example, can have a substantial impact, especially if it transfers to a sticker applied to the vehicle of a satisfied customer. The logo forms part of the overall corporate identity (this is made up of the logo, the brand's typeface or typefaces, and certain other specific design cues) that can then be used on business cards, flyers, websites and other marketing materials or media.

Remember that the launch of your business is a great opportunity to create interest in it – and you'll only launch a particular business once, so don't waste it. Therefore consider writing a short 'launch' piece for the local paper – new businesses are surprisingly newsworthy in the regional press – as well as undertaking the more obvious launch activity such as creating a website and printing business cards. Flyers door-dropped to local houses, golf clubs and business parks may also prove beneficial.

TRADING

Once trading, you will face a steep learning curve: you'll not only learn a lot about professional valeting or detailing, you'll also learn a lot about running a business and about yourself. If you don't love detailing, or lack the discipline to be self-employed, you'll find out soon enough. Detailing is a physically and mentally demanding job – and running a business isn't easy. If you make it past the first year, you will be doing well and could have a successful future ahead of you as a professional detailer.

A BUSY FOOL. . .

It is important that you can earn a living from your new venture. Detailing is a great hobby but an unforgiving profession: the work is hard and competition is fierce due to the minimal 'barriers to entry'. Also, customers rarely appreciate the highest standards of detailing, and can be completely satisfied with a much lower standard of service, thus playing into the hands of average or below-average operators. Therefore, analyse the business and its performance after the first couple of months, and then at least once a quarter. You'll also need to consider the factors described below.

Revenue

If you're not making money, you're not in business. So ensure that you are paid adequately for the hours you put into the job. There is a temptation to underprice and overwork in detailing – valeting can sometimes pay better per hour because the perceived standards (and therefore customer expectations) are far lower, plus there are fewer variables to catch you out in estimation terms. When you start out, you will need to be competitive, but remember that customers invariably appreciate a high quality service more than a low price. Should you need to meet a low price point, give a discount off a higher standard rate. This not only makes the offer more attractive – a customer would prefer a £100 mini detail discounted down to £75, rather than a plain £75 mini detail – it also protects the quality of your work and your brand. You are a top-level detailer giving lucky people a special discount (which can be withdrawn when the offer ends), rather than a 'bargain basement' detailer working at low rates.

When happy with the pricing of your services, check how long your work is taking. If you spend two days on a service that should take half a day, you will not be able to earn a living; even a standard detail could take seven to thirteen hours, and a full machine polish could take two or three times as long, so ensure that you price your time accurately. Spending too long on a job means that you'll either need to speed up, or adjust your rates (and this will only be possible if the quality of your work justifies a price increase). Being fully booked and earning a pittance makes little sense: this is where the phrase 'a busy fool' comes from. If detailing doesn't pay, find another line of work, and detail for a hobby.

Customer Demographic

Pricing can be adjusted according to the customers served. Location and 'demographic' (social and economic circumstances) may allow for higher prices to be commanded in some parts of the country compared to others; if houses are large and the area seems more prosperous, disposable incomes may be higher and the price paid for detailing services could be more generous.

Costs

Luckily, start-up and ongoing costs in detailing are relatively low, as customers are really paying for labour (expertise, experience and effort), not goods or associated costs. However, it is easy to get sucked into a higher cost structure: for example, be wary of brand new detailing vans on hire purchase, lavish detailing units with high monthly rent, rates and utilities costs, and – as you get larger – personnel costs. All will cost money whether you are busy or not, and this could make winter a struggle, even if spring is going well. If you are a simple owner/operator without many fixed costs, you will be able to survive lean times far more effectively.

Check costs versus revenue. It is normal to have higher start-up costs, but make sure you are making enough money to satisfy your needs. You may not want to become a millionaire, but you will still need to make enough money to live on, especially if you are working long hours and putting a lot of effort into the business. Keep a log of the time you spend detailing or valeting for the first few months, and then work out your gross profit. Is the amount earned per hour reasonable?

Growth

Is the business growing, or has it stalled? After the initial flurry of launch activity and its subsequent orders, demand may settle down, before hopefully embarking on a steady climb. If the business fails to grow, try and work out what is going wrong. Have you publicized your services enough to the target market? Is your pricing fair? Is the quality of your work and level of customer care/satisfaction high enough? Should there be no obvious or apparent failings in your strategy, then the medium- and long-term viability of your business needs to be considered. There may simply be too many competitive detailers in your particular market for a profitable business to be sustained.

BEST PRACTICE

The way you operate your business can be as important as how you detail. A well run business not only symbolizes professionalism and integrity, it can also save you time and money – perhaps making the difference between business success and failure.

Taking Bookings

Decide whether you will take a deposit, or risk customers cancelling at short notice. A credit-card machine will be useful here: take a £50 deposit, or 20 per cent of the value of the booking for larger jobs. Whilst you may still need to refund the deposit in some circumstances, it will help dissuade cancellations.

Charge for Paint Inspections

A mobile credit-card terminal, or card reader linked to a Paypal account by mobile phone, will be useful for taking deposits, as well as payments on location.

Too many detailers give their professional opinion away for free. If a customer asks you to inspect a vehicle, charge a modest inspection fee – it could even be refundable against any work you subsequently carry out. If you don't charge, you may end up assessing paint regularly for no charge, with little chance of converting it into paying work: people will use you for a free paint check-up. Serious customers, on the other hand, will gladly pay for your expertise – especially when they could get that money back later if they book you for rectification work (or regular maintenance in the future, if the paint issue was beyond rectification).

Checking Vehicles In

Whilst it may seem unnecessary or even distrusting of the customer, checking vehicles in is extremely important. It establishes prior damage, thus helping guard against claims of accidental damage that may be brought against you, and also allows you to fully assess the vehicle and the task ahead. A simple check sheet featuring a vehicle schematic with defects noted, signed and dated by the customer, is all that is required.

Don't skip it, no matter how tempting that may be, or how little time you have. Treat it as a form of insurance; boring and time-consuming perhaps, but essential. Many detailers have been accused of damage they simply haven't done, and had to placate, or even pay, an upset customer to avoid negative consequences. Likewise, the customer is reassured by being protected against you doing damage to the vehicle when it is in your custody. You both know the state of the vehicle when it is dropped off, and you will surely look after it when you have written evidence to its original state at the beginning of the job. In short, it's professional, it's fair, and it's in everyone's best interests.

Keep on Top of the Paperwork

Invoices or receipts need to be raised on the completion of, or payment for, a job. Don't invoice customers weeks later – if you aren't paid at the time, invoice them the same night or the next day. Keep every purchase receipt that is business related, and look into any tax benefits from running a 'home office' in a spare room if you don't have official premises. Without accurate and efficient records, running any business will be made more difficult in the long run (when tax returns need to be completed) and – more importantly – it will be impossible to gauge how profitable the business is. Should you be losing money, or making less than you think, you need to know immediately. It will also help identify where expenditure lies in the business, perhaps allowing you to target areas of spending in an effort to reduce costs in the future. Likewise, when you have a good month, you may be able to ascertain why, and build on that success.

CUSTOMER CARE

Answer every enquiry email promptly, and return calls as soon as you can. It is almost impossible to detail a car and be a secretary or receptionist, so ensure that your answer-machine message explains that you may not be able to 'pick up', but will return the call at the next available opportunity (and always within twenty-four hours). Never over-promise in terms of timings or work that can be achieved – always under-promise and then over-deliver if you can.

Be realistic with your estimation and quotes: meeting customers' expectations is critical to good customer relations. If you have moved a seat from its position to detail the interior, move it back, tell the customer or leave a small note/card explaining that this may have happened. Don't allow anything to happen that could be considered annoying or irritating, and do the best job that you can.

Talk the customer around the car on collection: tell them what you found tricky, or what took you the longest time. Don't bore them, but do explain certain aspects of the job; they are likely to be interested. Point out small details, such as how you cleaned inside the fuel filler cap, or detailed the door jambs. If the customer misses these, then they won't have a chance to be impressed. Always put yourself in the place of the customer: what would be important or impressive to you, if the tables were turned?

Amazon’s Jeff Bezos had a philosophy of ‘customer ecstasy’, and if this can be achieved, your customer base will inevitably grow and grow.

Dispute Resolution

At the extreme end of customer care is dispute resolution, or dealing with complaints and awkward customers. It is impossible to keep everyone happy, all of the time, no matter how good or compliant you are. Statistically you are therefore going to come across complaints, however justified or unjustified, sooner or later.

Firstly, identify the customers and situations likely to lead to unpleasant encounters. Pushy, ‘toxic’ customers who want a lot of work done for heavily discounted prices, or want to pay ‘cash’ for a discount, will be the worst to deal with. If they have so little respect for you, your profession, or the quality of your work that they attempt to haggle you down from a competitive price, they won’t appreciate a job well done. In some cases they may even find fault in the work delivered to negotiate a ‘last minute’ discount, or hint that the tax authorities may be interested that you gave a discount for accepting cash.

These customers are, however, relatively easy to spot. They are unlikely to leave a deposit or pay ‘list price’ for work. You can therefore avoid dealing with many of the worst offenders by having a deposit system when taking bookings, being robust in the face of discounting, and never accepting cash unless for full payment of a job in return for a receipt or invoice.

Should a dispute or complaint occur, listen carefully to the grievance in full. Do not act defensively until you have listened to, and understood, the complaint in its entirety. This is because many complaints arise from simple misunderstandings, and an overtly hostile reaction may be an over-reaction to what was actually a small issue caused by poor communication or differing expectations of what was sought versus what was delivered. These misunderstandings can often be settled quickly and amicably, without the situation escalating.

Of course, some complaints could be more serious, and some complainants more aggressive and difficult to placate. In these instances keep calm, do not admit liability (apologize for the situation arising, but say it needs further investigation), and then ask for the complaint to be put in writing. If you do receive correspondence, you will then know the exact nature of the complaint and be in a better frame of mind to respond to it; the risk at the time is that you could be bullied into an admission of guilt, simply to keep the customer happy and to deal with the issue quickly.

STAYING LEGAL

Small businesses always suffer from a modicum of legal administration, from filing annual tax returns and accounts to completing quarterly VAT returns. However, working with chemicals and detailing tools brings a new dimension to legal accountability.

CHEMICALS

anger
auses skin irritation.
auses serious eye damage.
ay cause an allergic skin reaction.
breathing dust/fumes/gas/mist/vapours/spray.
thoroughly after handling. Contaminated work clothing
not be allowed out of the workplace. Wash contaminated
before reuse. Wear protective gloves, protective clothing
face protection. Dispose of contents/container to
waste. IF ON SKIN: Wash with plenty of soap and
IF IN EYES: Rinse cautiously with water for several minutes.
contact lenses if easy to do. Continue rinsing. Seek
medical attention. IF SWALLOWED: Immediately call a
CENTRE/doctor. IF SKIN IRRITATION OR RASH OCCURS:
advice/attention.
away from food, drink and animal feedingstuffs.
available at www.dodo
anionic surfact
non-ionic surfact
allergenic fragr
Multilingual
DE
NL
ES
KO
ZH

You don’t strictly need MSDS information for all the chemicals you use, just the ones that are potentially hazardous to health. These will (or should) have a warning symbol on the label.

In the UK, COSHH (Control of Substances Hazardous to Health) regulations mean that material safety data sheets (MSDS) need to be collected for all potentially hazardous products used in the car cleaning/detailing process. Strong wheel cleaners and TFRs are typically hazardous – look for a hazard warning sign on the label – whereas quick detailers, shampoos and waxes are unlikely to be. The risk to health and safety whilst using that product then needs to be evaluated, perhaps with a recorded risk assessment. And then, finally, a decision needs to be taken on how to manage the risk.

Even if you don’t employ anyone, COSHH is still relevant, and an assessment needs to be undertaken because you could be using the chemicals in a way that affects third parties, for example, at a customer’s house. You’ll also have a better understanding of the chemicals you are using yourself.

Note that an MSDS sheet in itself is not a COSHH assessment, but it is a good first step. Due to the complication of COSHH compliance, it is important to seek accurate information from the Health and Safety Executive (HSE: *see* www.hse.gov.uk) in order to establish what you need to do to comply. This will differ depending on the size and nature of your business, so make sure you do your research.

POWER TOOLS AND ELECTRICAL EQUIPMENT

Companies with five employees or more will typically have more rigorous obligations when it comes to working with power tools, but even sole traders operating on their own would be advised to take reasonable precautions. Whilst written risk assessments may not be required for each power tool operated by smaller companies, all electrical equipment should be legally compliant according to HSE PAT (Portable electrical Appliance Testing) guidelines.

Interestingly, testing doesn’t necessarily need to be carried out at defined intervals (such as annually) or even by a qualified electrician, although there is a general legal requirement to ensure that all electrical appliances used by a business are safe, and tested by someone competent, beyond a mere visual inspection (unless new). This could be twice a year (or more) for regularly used items, or once every couple of years for infrequently used equipment.

RUN-OFF AND ENVIRONMENTAL CONSIDERATIONS

Another area of law to be aware of is environmental regulation. The Environment Agency in England and Wales and the Scottish Environmental Protection Agency (SEPA) have wide-reaching powers governing run-off of waste wash water and chemicals into the environment. Note that clean run-off is never under scrutiny, it is only polluted run-off that is likely to be regulated, whether polluted by chemical residues or dissolved contaminants such as oil, grease and so on. In these instances, a permit may be required or special precautions specified (such as bunded wash mats). Remember that disposing of water in the kitchen sink can be more environmentally responsible than pouring it down a storm drain, as domestic waste water gets treated, whereas storm drains tend to lead straight out into the countryside.

GROWING YOUR CUSTOMER BASE

To grow your customer base, you need to acquire customers faster than you lose them. If you do a good job, customers are, of course, likely to return, so customer satisfaction must be paramount. Try and exceed their expectations: clean and detail parts of the car that other detailers may not, such as door shuts and fuel filler areas. Recommend a care regime when they pick the car up – most detailers and valeters won’t do this. Explain what products and processes were used, if the customer shows interest. Always answer emails and phone calls promptly, and keep to your appointments. Being reliable and trustworthy will guarantee you future business, far more than low prices or seductive promotions.

It is far easier to retain existing customers than acquire new ones, so you should never take existing customers for granted. Email them occasionally with a relevant news update or special offer, but never ‘spam’ them. Offer them a percentage off a future detail, or a fourth detail for free (after they have booked and paid for three at full price). Send them a card at Christmas. Generally, keep in touch, treading the fine line between being distant (and out of mind) and over-familiar or pushy.

To gain new customers, do a good job for your existing customers: they will talk, and their friends will soon know about your talents. Visit business parks and offer to keep company cars clean for a monthly retainer, covering a certain amount of work per week. Businesses have images to uphold and taxdeductible expenditure, while private customers are rarely in the same position. Do demonstration days at nearby golf clubs, perhaps offering a club a small commission on new work booked. Try leaflet-dropping local houses, giving a second vehicle a wash for free when the main vehicle of the household has a more extensive detail.

The possibilities are virtually endless, and with millions of vehicles being used every day, there is plenty of work for the dedicated and enthusiastic professional detailer.

MAKING A BUSINESS VIABLE

Sometimes the difference between business success and failure can come down to the narrowest of margins, and a small increase in revenue, combined with a modest decrease in costs, can make a business viable and sustainable.

BOOSTING INCOME

Charge for Extras

It may be acceptable to charge a little more for a superior wax to be applied to the car, rather than a standard wax (after all, the wax will have cost you more to buy). Also, additional wax or sealant layers should be chargeable, as it takes extra time and uses more product.

Never be afraid to ‘upsell’: you can still provide a good service and attentive customer care without having to work for free. Ensure that you estimate the work adequately, and identify what aspects the customer considers essential, and what are categorized as ‘optional extras’. Price the extra work sensibly, but explain that it takes longer and therefore commands a small premium. For regular (and therefore good) customers, these extras can be included at no extra cost – but it is important that they still have a meaningful value. Wax (type) upgrades, extra wax layers, engine-bay work, sealing glass with nano products – all these can be charged in addition to the ‘normal’ work.

Selling Maintenance Products

Consider selling maintenance products such as microfibre cloths and specialist detailing products. Microfibre bales can be bought cheaply at wholesale ‘cash and carry’ outlets, and specialist manufacturers will usually be happy to supply you with stock at wholesale prices (note that sometimes a minimum order may apply). If you create a kit using these, then you can add it to the detail ‘menu’ so that customers can maintain their vehicle properly afterwards. As you know, a lot of the good work done by a detailer can be defeated by a poor maintenance regime. Washing-up detergent, a grit-laden sponge and a poor quality synthetic chamois or water blade could undo your hard work – and even lead to an unhappy customer (when they unwittingly remove the wax you applied with washing-up liquid). That means there’s an additional benefit to selling maintenance products. It’s not just about the income: good maintenance benefits everybody.

Working with Complementary Suppliers

Companies providing dent repairs, paint resprays, vehicle transport, wheel refurbishment or paint protection film will often have a commission or introduction-fee system, where they will pay you for leads or business generation. You will obviously have to let customers know that they need to mention your name when you give them the card or brochure of the complementary supplier. Be careful with the ethics of this, of course, and never recommend unnecessary work or a supplier that you wouldn’t be happy using yourself. But if the customer’s vehicle needs additional work that you can’t provide, then you will be doing them a favour by recommending a trusted supplier, the supplier a favour by generating custom for them, and yourself a favour by earning a small amount of commission (or just some goodwill). When the model is ethically applied, everybody wins. You have simply marketed the supplier’s business for them, and have then been paid correspondingly for having done so.

If you don’t get paid, the supplier may remember the favour and recommend you to their customers in the future. You’ll still benefit, even if no money changes hands.

Provide a Training Service

Another avenue of extra income would be to provide a training service to local car washes, dealerships or private customers: your skills and experience are valuable, and people will pay for tuition. Offer one-to-one coaching or group sessions. Private individuals as well as trade customers may be interested, and you could earn more money per hour than if you were just detailing or valeting. You will need to have reasonable presentation skills and be confident, however, and it would be wise to look at the legal implications; a disclaimer might be signed by students, stating that they will indemnify you from any legal action resulting from techniques or processes learned in your training class.

Remember that any pupil under your care will also be your legal responsibility throughout training, so consider having public liability insurance cover, and even mention tuition specifically to your insurer if you increase either the variety or frequency of your courses.

REDUCING COSTS

Buy at Trade Cost

Buying products in bulk, or in concentrate form, can save you money – and always ask for a trade discount: you may be surprised how many businesses will help out fellow traders.

Buy your supplies wholesale, whether from a ‘cash and carry’ or direct from specialist manufacturers. And always ask for a trade discount, whatever you buy – even seemingly dissimilar industries may give discounts to fellow businesspeople. The technique may not work every time, but you’ll have nothing to lose by asking. There is more flexibility in pricing than consumers are conditioned to believe, although this only tends to apply to situations where the person you are dealing with has control over pricing (it won't work with the cashier at a supermarket, for example; you need to speak to staff at manager level).

Customer-Supplied Facilities and Products

Instead of paying for the purchase and running costs of a van with an in-built water tank and generator, you could operate from a moderate-sized car if the customer has a suitable water and power supply that you could use. This may mean that you can't serve all customers in all conditions, but it will reduce costs. Regular customers, with known facilities, will obviously be suitable candidates for this kind of operation. If you are starting out and don't have a wide range of products to hand, you could even offer a discount to the customer if you use the materials they provide – every motorist is likely to own some car-care products (although these may be unsuitable, old or of poor quality).

Whilst using facilities is generally acceptable, using customers' products is not recommended in the mid to long term as it can seem unprofessional and also possibly lead to inferior detailing results.

Borrow or Share Premises

Even a small industrial unit can cost a lot of money to operate on a monthly basis: rent, rates, electricity, service charges – it all adds up. If you can use your own garage, this may lead to cost savings. If not, consider borrowing or sharing premises. Perhaps pay a small 'rental' payment if you do use someone else's premises – they will be more obliging, and you only need to make a payment when you have the work to cover it. Finally, remember to be considerate with noise and the amount of room you take up, if borrowing or sharing a unit – and always tidy up afterwards. Shared spaces aren't shared for long if irritations persist.

Become VAT Registered

Registering for VAT is obligatory above a certain revenue threshold (currently about £80,000 per annum in the UK). Below that amount, it is optional. If you can cope with the additional administration, it makes sense to voluntarily apply for VAT registration if you mainly serve a trade audience (such as car dealerships). This is simply because trade customers are likely to be VAT-registered themselves, and the VAT amount is fully reclaimable by them (and therefore unlikely to be an important aspect of cost analysis when choosing a supplier). You, however, will be able to claim back VAT on every qualifying business expense, including fuel. At the current rate of 20 per cent, this represents a substantial prospective saving.

Operate Locally

Operate locally before you branch out regionally or nationally. Operating locally means your costs will be lower than if you have to cover larger distances and advertise more widely. If you genuinely need a regional or national audience for your business to prosper, then you may need to swallow the additional costs. But if you have enough custom locally, don't branch out until demand has been met entirely. As your business horizons expand, so do your costs.

Word of Mouth

Word of mouth is usually more effective than expensive advertising. It is tempting to be seduced by the glamour of national advertising, and in some cases – for instance, when you wish to establish a premium national brand – it is undeniably useful. But when it comes to procuring customers or generating revenue directly, it rarely covers its costs. Therefore, spend money on a basic website, flyers (double-sided full-colour flyers only cost a few pence each) and business cards, before you start placing print ads – and don't forget that word of mouth will be more effective at generating leads and retaining customers than any marketing campaign. Do a good job at a fair price and look after your customers, and then you will attract new business naturally.

The exception to this rule is a well targeted Facebook campaign. Social media offers interesting marketing opportunities; a narrow or specialist market can be accurately targeted (say, local car enthusiasts) for a relatively small sum. A promotion or offer aimed at this audience may reap rewards and your social media profile will also be raised. Remember to keep your page or channel updated with pictures of cars you've detailed and car-care hints and tips. If you do, you'll attract followers and a ready-made audience for future marketing activities.

TRAINING, TRADE ASSOCIATIONS AND ACCREDITATION

Is there strength in numbers? Will training benefit you? Does accreditation get you business? These are all natural questions for professional detailers, and there are no simple or straightforward answers. Let's approach them individually.

TRAINING

You'll never stop learning as a detailer, and a quest for knowledge is the basis of a rounded and highly developed skill-set. Most of your learning will come from experience 'on the job', and theoretical training is limited because of the near-infinite variables that present themselves during detailing. That doesn't mean that tuition is redundant – it is still relevant and valuable – but it does mean that you shouldn't place too great a focus on the theoretical.

Most valeters and detailers need little basic training, but for techniques such as machine polishing and wet sanding, which could damage customers' cars if carried out incorrectly, it often makes sense to seek tuition. This training is likely to be offered by another detailer or a car-care company/organization. Ensure that the programme covers what you need, and that the training staff are sufficiently qualified; there is little point going on a course that offers nothing new or is run by detailers at a lesser level to yourself.

Be wary of certificates – these are fundamentally meaningless and over-valued unless there is a genuine assessment of your abilities at the end of the course. It also helps if the certificates are recognized by consumers – otherwise you might as well be printing your own diplomas, for all the effect that they will have.

TRADE ASSOCIATIONS

There are few trade associations in the world of valeting and detailing in comparison to other industries. However, it is an industry that suits some form of regulation or trade association, given the large number of independent business owner/operators and the relative lack of regulation at present. Currently, anyone can set themselves up as a practising professional valeter or detailer, and then become the custodian of an expensive – and in some cases, priceless – vehicle, soon afterwards. They could then proceed to apply some of the strongest carcare chemicals in existence on to potentially delicate finishes, without any form of training, or even liability cover. The reason for this lack of regulation seems to have stemmed from the artisanal nature of valeting itself: it has never been a trade that has seen qualifications, guilds or even apprenticeships become commonplace.

Most detailers are sole traders who start up and then operate alone. Without these core members wishing to be organized by a larger body (and indeed, this may be one reason why sole traders have left larger businesses and set up on their own) there is little impetus for its creation. The only way a trade association could work would be if it offered something of value to its members – perhaps shared marketing resources, training, and discounts on insurance or products. This is exactly what a UK organization called Professional Valeters & Detailers (PVD: www.pro-valets.co.uk) is already achieving, and it is hoped that it will go from strength to strength and become a trade association of significance and importance in years to come.

ACCREDITATION AND AUTHORIZATION

Is your car prepared for winter?
Find your nearest Pro Valeters & Detailers
pro-valets.co.uk
THE UK'S LARGEST CAR CARE TRADE ASSOCIATION
CarPro
SWISSVAX
BRITEMAX
Koch Chemie ExcellenceForExperts.
Angelwax
nanolex
deandetail
FC
CLEAN+SHINY
Furniture clinic
ALLGOOD CAR CARE
CHIP & PIN
CHIPEX
COVERSURE
DETAILING

Protect your car against the ravages of winter. Salt, grit and mud all take their toll on your cars paintwork and wheels – you can protect your car using the latest products and methods. Using wax, sealant, or ceramic solutions, your car will also be much easier and more efficient to clean. Your glass can also be sealed, improving visibility and reducing fogging up on those frosty mornings. Stand out this winter – get your car protected by a Skilled, Proven, and Insured car care professional.

Professional Valeters & Detailers (PVD) is an organization that supports and markets its whole membership base, in return for a reasonable monthly fee.

If some form of diploma, certificate or membership scheme has a marketable value, then it may be worth pursuing – but be cautious if it means little to consumers. It is mere vanity to collect dozens of certificates that are almost meaningless or worthless. Accreditation based on training and qualifications can have real value, and authorized detailer schemes run by manufacturers of car-care products can also offer something worthwhile. But it is important to check what such a scheme offers. Does it profess to increase your custom, or send you leads? Are there any costs associated with it? Will there be marketing benefits? How exclusive is the scheme? Will you be one of a dozen detailers on the scheme in designated territories, or will you be one of a hundred detailers with a competitor on the next street?

There are no strict recommendations, of course. A free scheme may be worth joining simply for discounts on products, and very little will be demanded from either party. But on the fee-based schemes, ensure that you are going to get a good return from membership. If it costs thousands per year to be an active member, and you make very little revenue from the custom it generates, you could simply be throwing money away. Bring it up with the organizers as soon as possible, perhaps even demanding some or all of your money back.

Finally, if you want to become a detailer or valeter full time, the authors wish you every success. There are easier and more lucrative vocations, although most will not be as emotionally rewarding. Above all, aim to be the best rather than just another alsoran. There are too many average, or below average, valeters and detailers in the market, and too few good or exceptional ones. If you do well, you may not be an overnight success, but you may just have a lifelong career doing a job you love.

GLOSSARY

0ppm (zero parts per million) A designation of pure filtered water that doesn't contain any particulates (and therefore dries without water marks). Partially filtered water will contain some contamination, perhaps 30 or 50ppm; mineral water may contain 100ppm or more; hard water may contain up to 400ppm in calcium carbonate deposits.

Alcantara Brand name of a leading synthetic suede material.

aniline leather Uncoated leather hide, dyed all the way through to give it colour. Most commonly found in classic cars. The hide is normally treated with oils, creams and waxes to enhance and protect its finish.

APC (All-Purpose Cleaner) A stronger cleaning product, typically made from surfactants and solvent.

backing plate The interconnecting part between the machine polisher and a pad – a mounting plate with a connector on one side and hook and loop backing on the other.

baggy/baggie A thin polythene bag used to test the slickness of a paint surface.

beading The action of water being sufficiently repelled by a hydrophobic coating, causing round water beads to appear on the surface. This occurs because the water droplet's surface tension remains largely intact because of the 'water-hating' surface it sits upon, allowing the water droplet to attempt to revert to its natural spherical state. Note that natural waxes often show excellent initial beading because of the oils within their honeycomb structure;

when these oils evaporate or the wax layer becomes contaminated, the subsequent coating is likely to break the surface tension of water droplets and subdue beading.

bodyshop A bodywork repair and paint spray business, often employed to fix accident-damaged vehicles. A bodyshop is the likely destination if your car needs a partial or complete paint respray.

bonnet bra Removable padded apron covering the front bumper or bonnet of a car, to protect the paintwork from stone chips and other damage.

bucket dolly Wheeled platform/base to enable buckets to be moved or manoeuvred.

bucket filter Grid for the bottom of detailing buckets, to stop dirt being picked up by the wash mitt or sponge, and to help prevent dirt being swirled up every ‘dunk’. Grit Guard is the most famous example; an adjustable UK version is the Scratch Shield.

buffing cloth Cloth made for removing product residue and buffing a surface to a shine, usually after the application of a polish or wax. Divide buffing cloths into different types: the softest can be used for delicate finishes where inadvertent marring is more likely; suedestyle cloths can be used for secondary buffing to prevent oil holograms; waffle-weave cloth is fantastic on glass; and old microfibres that are past their best can be used for underbonnet or underbody areas.

bunded wash mat A mat that contains water, chemicals and contamination from the wash process to prevent it disappearing down storm drains into the water course.

burnishing (jewelling) Machine polishing for ultimate refinement, using the finest cut pads, polishes and/or glazes. Sometimes plain water will be used as a machineapplied glaze. The aim is to achieve the glossiest, most reflective finish possible.

cellulose Solvent-based paint type, typically found on classic/vintage vehicles. Not clearcoated, so prone to fading and scratching. Often easily damaged by aggressive products (especially strong solvents and abrasives) and aggressive detailing processes.

ceramic clearcoat (and **ceramic sealants)** Ultra-hard silicon dioxide (quartz) ingredients added to clearcoat paint or applied in the form of paint sealants, are typically classed as ‘ceramic’. These coatings are more scratch-resistant and harder wearing than traditional alternatives. Sometimes referred to as ‘nano’ due to their small particle size, which can lead to increased adhesion on the substrate they are applied to (and therefore afford better longevity).

cerium oxide A highly abrasive compound, used for removing deep scratches in glass. It is extremely destructive to painted finishes.

claying The action of contamination removal using a clay bar (a bar of elastomeric polishing media), which abrades, shears and plucks embedded contaminants found on the paint surface. Clay bars come in different grades (finer grade clays are less aggressive in action than heavier grade clays) and should be used with clay lubricant (to lubricate the clay bar itself and the contamination being removed). Clay marring is a form of mild paint scuffing that can occur if the clay action is too aggressive for the paint surface being decontaminated (although it can be easily corrected through machine polishing).

clearcoat The transparent top coat of lacquer, sprayed on to coloured paint, that gives car bodywork its final glossy and hard-wearing finish. Technically it is not paint as it does not contain pigment.

cobwebbing The myriad of interconnecting swirl marks on a painted panel, usually caused by inattentive maintenance (such as a poor wash technique). In sunlight, the swirls may resemble a cobweb.

colour coat (or **base coat)** The coloured paint layer(s) sitting above the primer coat but below the final layer(s) of clearcoat. Without the colour coat, modern paint finishes would resemble lacquered primer; the colour coat is what most onlookers identify as ‘paint’. The clearcoat is effectively invisible.

compound A polish, usually with a heavy cut and applied by machine. The term refers to the older-style block or paste polishes used in the bodyshop and metalworking industries, but is now used generally to describe all types of aggressive polish. Cutting paint is sometimes referred to as ‘compounding’ it.

concours A type of competition focusing on high-end car preparation. Unlike detailing ‘show and shine’ competitions, originality and patina may also be taken into consideration during judging (as well as cleanliness and thoroughness of preparation). This can potentially lead to some bizarre situations, such as a car being marked down if the original unsightly ‘orange peel’ in the paint has been removed by expert wet sanding or machine polishing. Short for ‘Concours d’Élégance’ (French origin, literally ‘competition of elegance’).

connollization A leather treatment process that colours the hide, pioneered by the Connolly company. Coated leathers are the most common type found in modern vehicles.

contact wash Wash process where a wash mitt or sponge makes contact with the paint surface, resulting in a marring risk.

contactless wash Wash process where there is no direct contact with the paint surface (from a wash sponge or mitt); a pressure washer and cleaning products will most likely be used to clean the paint ‘contactlessly’.

covalent Chemical bonding that can lead to more effective adhesion; often seen with nano glass sealants due to the relatively active nature of glass. Covalent bonding does not happen with painted surfaces though, because paint is inert (nano products will bond with paint through traditional physical adhesion, rather than chemical covalency).

D-handle D-shaped top handle affixed to machine polishers, in preference to a side handle. It allows more pressure to be exerted directly over the polishing head.

decontamination pad A pad covered in an elastomeric paint that removes contamination from paint in a similar way to a clay bar. Microfibres covered in this coating are sometimes referred to as ‘nano skin’ cloths.

de-ionizing resin system Water purification system using ion-exchange to neutralize hard-water limescale particles, thus preventing them precipitating out into unsightly water spots. A good way to prevent water marks, but potentially expensive as the media will need replacing after a certain amount of water treatment has taken place.

de-nibbing Removal of contaminants that have accidentally become bonded into a layer of fresh paint, for example, dust, dirt and fluff particles. These can be removed using sanding paper or by a de-nibbing tool (a tungsten carbide blade).

detailing The systematic process of cleaning, enhancing and protecting the interior and exterior surfaces of a vehicle. The attention to detail, often exemplified by the machine polishing of the paintwork to remove swirl marks and other imperfections, gives the process its name.

detailing spray (or **quick detailer)** A water-based light-cleaning and gloss-enhancing spray; its lubricating properties make it ideal for the removal of light contamination after a maintenance wash without endangering wax or sealant previously applied to the paint.

detailing swabs/sticks Small swabs for cleaning intricate areas of a vehicle, such as around badges, in and around door locks, switchgear, climate control vents. The best types will be made from a soft, lint-free material. Cotton buds should only be employed as a last resort, being neither particularly soft nor lint-free.

diminishing (and **non-diminishing) abrasives** Polish particles that break down from a larger size to form smaller particles during the machine-polishing process are termed ‘diminishing’. The cut of these polishes diminishes as the polish is ‘worked’ and they effectively refine the finish themselves if used for long enough. Non-diminishing abrasives remain the same size and do not break down (meaning they are sometimes called ‘unigrit’) and they therefore cut at a consistent rate. They do not ‘auto-refine’ the paint during the polishing process (but that it not to say that they will necessarily be coarse or incapable of a refined finish).

door card Trim panel that affixes to the interior side of a car door.

drag marks Lines left in an oil or wax residue/coating, made by the fibres of an applicator pad or buffing cloth. These may sometimes resemble physical micro-marring/scratching, but they are actually marks in a temporary coating and easily removed.

drop back The evaporation of glaze oils from the paint surface, resulting in the underlying paint finish being revealed. Machine-polishing compounds frequently contain glaze oils, resulting in an enhanced finish that does not correlate with the true level of paint correction actually attained.

drying aid A lubricated detailing spray formulated to prevent any residual dirt particles from marring paint during the drying process, after washing/rinsing.

dual action Orbital machine polishers may have a driven spindle and a driven orbit. If so, they are referred to as ‘dual-action’ machines. If only the orbit or the spindle is driven, they are technically only ‘single-action’ orbital machines (although all types of orbital machine are commonly referred to as ‘DA’).

dusting In process terms, the act of removing settled dust from a surface. In product terms, the creation of dust, either during cutting/polishing, or after curing/buffing.

dwell time The amount of time a product is actively working on the paint/surface. Some products require longer dwell times to ensure adequate performance, other products may damage sensitive finishes, or become troublesome to buff off, if left to dwell.

edging Microfibre cloths can come with various types of edging, with the main types being edgeless, stitched and material covered (in anything from regular microfibre to ‘silk-effect’ cloth and microsuede). Harsh edging treatments or materials may scuff delicate finishes, even though the main fabric may be completely safe to use; therefore care needs to be taken to assess edging when using any type of cloth.

etch primer A chemical primer (undercoat) applied to a metal panel before painting. Adhesion of this undercoat is increased by the aggressive chemical reaction between the primer and the metal.

etching Deep damage to paint or clearcoat caused by the corrosive action of acids or alkalis. Bird mess is a major cause of paint etching, especially if left to dwell and not removed in a timely manner. Water droplets can also become corrosive in certain conditions (say, if cement dust or volcanic ash has been dissolved into the water droplet) and these may lead to etched water marks if they are left to evaporate.

fallout Airborne contamination, typically small metal particles from brake discs and brake pads, but could include railway track debris, contamination from steelworks. Whilst most iron fallout will sit on paintwork and be removed easily during a maintenance wash, some will become embedded (because iron is harder than paint/clearcoat) and will need to be removed using a clay bar or fallout remover.

filling The optical enhancement of a painted finish by the addition of temporary oils, resins or waxes. These fill microscopic defects (small swirl marks and so on), allowing for improved reflections and a better finish. Note that deep defects cannot be filled using oils or waxes, and will require bodyshop filler (a cement-like paste) or paint to fill them.

fingernail test Testing the depth of a scratch by running a fingernail across it; if the scratch can be felt then the scratch may be too deep to correct successfully using detailing techniques.

fish eyes Small round indentations in a coating caused by the coating refusing to flow over or into a spot occupied by a repellent contaminant. Paint will fish-eye if a silicone spray has been used on the panel beforehand, for example, and the residue has not been removed prior to painting.

flash off Evaporate quickly. Strong solvents will flash off when a product cures.

flat (**paint**) The opposite of glossy. A dull or non-reflective finish could be referred to as ‘flat’, although it is sometimes used to describe a non-metallic paint (‘the car is flat red, not metallic red’).

foam lance An attachment for a pressure-washer lance that is specifically designed for the application of a foamtype cleaning product to paintwork (for example, snow foam). Typically it consists of a large dosing bottle and two mixture controls (one for mixture and one for compression). Note that you need a pressure washer – a foam lance will not work on its own.

fogger An aerosol can or specialist smoke machine that fills a car interior with vapour (usually some form of odour neutralizer). The can versions ‘lock’ after activation, allowing them to spray continuously until all the product has been depleted. The car’s ventilation system circulates the product to ensure all parts of the interior and ventilation system are treated.

French polishing A wood-finishing technique that gives interior trim panels a high gloss, glassy appearance. True French polishing relies on the application of shellac (a natural resin) dissolved in solvent. It has largely been replaced by more modern techniques, such as the application of a tough varnish or clearcoat to the wood. French-polished wood is generally more delicate than lacquered wood and therefore needs treating with more care, if found in a vehicle.

gelcoat A coloured resin used during the creation of glassfibre panels to give them an exterior finish. It resembles a single-stage paint and can usually be machine polished successfully.

glaze An abrasive-free solution designed to add gloss to a material surface. Usually an oil of some nature (perhaps a silicone oil).

hologramming Fine swirls and micro-marring that create a shimmering hologram effect when viewed in direct sunlight or with another spot light source. They can be either physically cut into the paint, perhaps by a harsh machine-polishing compound used on soft paint, or caused by smears in a temporary coating that have been left behind after the buffing process (this could best be described as ‘oil hologramming’).

hydrophilic Water loving. Sealants are often water-loving, causing water to sheet or ‘fish eye’ on the paint surface as the water molecules are broken down and run off the panel.

hydrophobic Water hating. Waxes tend to be water hating, repelling water droplets in a way that creates small beads (‘beading’).

kerb rash Damage to the rim of a wheel caused by contact with a kerb. If light, a wheel refurbishment can usually bring the wheel back to a new condition, but heavy contact may cause buckling or structural issues and necessitate wheel replacement.

lacquer peel Clearcoat failure, where the lacquer lifts from the underlying surface leading to a dull and flaky finish. Only remedied by the removal and reapplication of clearcoat.

levelling The action of buffing a product to a consistent finish; high points and low points are ‘levelled’ by the buffing cloth via abrasion/absorption.

limonene A naturally occurring solvent commonly found in citrus degreasers. Often referred to as ‘orange oil’ because it can be extracted from the skin of oranges and has a pleasant citrus aroma. Technically, a liquid terpene.

LSP (last step/stage product). Wax or sealant, so called because these are usually the last products to be applied in the detailing process. The phrase helpfully avoids making a distinction between products that effectively do the same task, although ‘PP’ (protection product) would arguably be even more suitable as an acronym.

machine marks (buffer trails) Small swirls created in circular or elliptical patterns on the paint or clearcoat surface, by the action of a machine polisher. Sometimes called ‘machine hologramming’ due to the shimmering finish that results when an affected panel is viewed in strong sunlight.

machine polishing Cutting of paint to remove defects, carried out by a mechanical process using a polishing machine (typically electrically powered, but could be air powered). Only a fraction of the paint finish is typically ‘cut’ (removed) to reveal ‘fresh paint’ beneath (resulting in a new and unblemished finish).

machine-turned (finish) A decorative finish applied to metal, usually trim. Traditionally created by marking the metal in a uniform pattern, this finish may be inadvertently damaged or removed through polishing.

magic sponge Abrasive sponge used to remove contamination; these can mar sensitive finishes and also break down with use.

marbles (tyre marbles, rubber marbles) Small, round rubber deposits flicked up on to bodywork, usually during track days or other kinds of circuit driving. Rare on the road, but common on track due to the softer tyre compounds used.

microfibre A synthetic material with a very large surface area created by millions of tiny filaments (twenty times finer than a human hair) that can therefore excel in removing dirt or product residues (by lifting and trapping), and also excel in absorbing liquids. Closed-loop microfibre has looped strands, open-loop microfibre has cut strands. The density/weight, weave and constitution (polyester/polyamide ratio) of the cloth will all have an impact on its characteristics and performance.

micro-marring Very small scratches on the surface of the paint or clearcoat. Caused by fine-grade scouring, perhaps from machine-polishing pads or compounds.

microns Microscopic units used for measuring paint thickness (paint 'depth'). A micron is 1/1,000th of a millimetre, and is technically called a micrometre; micron is an officially defunct term but still widely used. Paint (made up of multiple layers) on a typical car may be 140–180 microns in overall thickness, with perhaps 40 microns being the upper clearcoat layer; a sheet of A4 paper is approximately 100 microns thick.

mohs A unit of hardness – for example, diamonds have a high mohs rating. Silicon dioxide nano-ceramic sealants may be resistant to certain types of scratching if they have a high mohs rating. Traditional waxes and sealants are likely to have low mohs ratings.

mopping Machine polishing. The name derives from the shaggy woollen machine-polishing pads typically used by bodyshops for aggressive paint finishing post-spraying (these resemble woollen floor-mop heads). An urban myth has 'mop' as an acronym for 'machine operated polisher'. This means that 'mop' may refer to a machine polishing pad (correct usage) or a machine polisher itself. Needless to say, 'mopping paint' does not refer to the removal of any moisture, it simply refers to cutting it by a machine-polishing process.

OEM ‘Original Equipment Manufacturer’. A part or accessory made or approved by the original manufacturer would be classed as an ‘OEM’ part.

oleophobic Oil hating, rather than hydrophobic (water hating). Oleophobic coatings repel oils and some solvent-based liquids. These may prove effective in protecting surfaces against certain classes of contaminants, say, denim dye from jeans (which could stain light-coloured leather seats).

orange peel Paint defect resembling orange peel, having a rippled or dimpled appearance. Caused by the paint failing to flow correctly during curing, or due to it being inadequately sanded or polished. Powdercoated finishes may also show orange peel.

out-gassing Solvent evaporation from a product, usually taking place when the product ‘cures’. Products will generally out-gas more slowly in cold conditions and in a humid environment (the moisture in the air inhibits evaporation).

overspray Small droplets that miss their intended location during a spray application process, either because they physically miss, or because they bounce off a hard surface. These may be missed and therefore dry or cure without being adequately buffed.

oxidation The UV degradation of paint or clearcoat, creating a faded or dull finish (for example, when vintage red paint turns pink in colour). Originally down to oxidation of lead pigment, but now simply down to the action of the elements (most significantly, ultraviolet rays from the sun) breaking down the polymer bonds on the surface of the coating, creating a rough and frosted finish.

paint correction Improving the finish of paint (or completely renovating it), usually through machine polishing (although it can be achieved through manual polishing). ‘Correction’ means the removal of unwanted defects (swirl marks, etching and so on) that should not be present in the paint surface.

paint protection film (PPF) A thin, clear plastic film applied semi-permanently to paintwork to protect it against stone chips and scratches.

panelwipe Strong solvent, perhaps mixed with other cleansing chemicals, designed to remove all oils, resins and waxes from a panel (typically before it is resprayed).

pass rate The speed a machine polisher travels across a panel during the paint correction process. The faster the pass rate, the less cut will be enacted upon the panel. Conversely, slower pass rates lead to greater cut.

patina The natural wear and degradation of a finish on classic cars, commensurate with their age. Removing this patina through restoration may count against the vehicle in concours competitions due to a loss of originality.

PDR (Paintless Dent Repair) Method for removing small dents from bodywork by beating and pulling; often a convenient and cost-effective alternative to booking the vehicle into a bodyshop for major panel repair.

piano black A modern interior finish, usually found on plastic decorative trim pieces. Notoriously soft and prone to scratching, piano black finishes need to be detailed with the utmost care.

pig-tail A small semi-circular scratch or scuff, caused by an orbital machine polisher or orbital sander digging into the paint because it has not been kept level. Machines with a bigger throw may cause deeper pig-tails. Orbital sanders are more likely to cause visible pig-tails than orbital polishers because sanding paper is far less forgiving than a polishing pad.

pinstriping Thin paint stripes carefully applied to coachwork. Popular with older vehicles and hot rods. Painstaking to complete compared to the application of thin vinyl strips (genuine pinstripes would either be carefully masked or painted freehand).

polish An abrasive mixture designed to clean, cut and shine a material surface. Non-abrasive products of a similar nature are better described as cleansers or glazes.

polishing set When machine polishing, running the machine polisher over its worked area is counted as one ‘pass’. A set comprises a number of passes, so three sets of six passes would mean the machine polisher has worked the area eighteen times in total.

polyester/polyamide ratio Microfibre material is woven from polyamide and polyester fibres, usually with an 80/20 polyester/polyamide mix, although the absorbency of the material can sometimes be increased by altering the polyamide ratio to 70/30. Towels that are 100 per cent polyester may feel like regular microfibre, but will be totally unabsorbent.

posh wash A high quality, two-bucket maintenance wash, usually carried out as part of a regular detailing contract by a high end detailer. The aim will be to ensure that swirls are not introduced to the paint and that waxes or sealants are not removed (something that could not be guaranteed with the service from a regular hand car wash).

powdercoating A durable coating that is sometimes used instead of paint. Applied as a fine powder, electrostatically, before being cured (by heat) to give it a final finish. Powdercoating can be more economical than painting, and is tougher as a coating type. However, it may chip and can have a mottled ‘orange peel’ appearance due to insufficient ‘flow’ during curing.

ppi (‘pores per inch’) A unit of foam density, signifying how many foam pores (bubbles) are present per square inch of foam material. The higher the ppi, the denser the foam. Denser foams can potentially hold more water, feel softer and suffer less from dirt ingress.

pre-wash The earliest part of the wash process, designed to dislodge contamination and wet the vehicle surface, before the main contact wash takes place. Chemicals could be employed, or it could be completed simply using a pressure washer with plain water.

pre-wax cleanser Usually a type of polish, a pre-wax cleanser is designed to prepare a paint surface before the application of an LSP (wax or sealant). Typically it will clean, polish and add gloss to the surface.

primer A coating applied to a bare material (usually metal or plastic) that helps create a smooth and adherent surface for forthcoming layers of paint, during the painting process. Primer may also help prevent corrosion (for example, rust).

PTG (Paint Thickness Gauge). A device for measuring paint thickness. Advanced PTGs may be able to measure the thickness of paint on non-ferrous or non-metallic surfaces (for example, glassfibre or carbon fibre), and even the thickness of individual paint layers. Ferrous (magnetic) PTGs are the most common type on the market, and relatively inexpensive; ultra-sonic and eddy current PTGs are more expensive but can work on non-ferrous surfaces. Note that the heavy metal flake content of some metallic paint types could compromise the accuracy of readings with certain PTGs, but this is unlikely to affect standard detailing work.

rainbowing An optical effect seen on certain coated surfaces when the coating thickness is inconsistent or irregular, leading to multi-coloured patterns being seen. Similar to when a film of oil is seen on water.

reverse osmosis Method of purifying water, where water molecules pass through a semi-permeable membrane, leaving contaminants behind.

rinseless wash Product or process where a final rinse is not required; the (highly lubricated) shampoo solution is applied to the panel and then immediately buffed to a shine.

rubbing compound An aggressive heavy-cut polish for hand application to deeper paint defects. Used primarily by bodyshops and with the potential for striking through paint if inexpertly used. T-Cut is the classic example of a consumer-targeted rubbing compound.

run-off Water, product and contamination residues from the wash process; these will often ‘run off’ the vehicle’s bodywork into a storm drain. Run-off is primarily clean(ish) water and has little effect on the environment, but care should be taken when detailing heavily contaminated cars with aggressive and polluting chemicals.

sacrificial layer/coating A coating that absorbs some of the contamination it is exposed to, rather than fully repelling it. When the coating is removed, the captured contamination is removed with it. Organic waxes (such as carnauba-based waxes) are typical sacrificial coatings.

secondary marring Marring caused by the paint correction technique itself. The primary defect is within the paint initially that the detailer is attempting to remove. Secondary marring is minor paint damage caused by the pad or polish during the correction process. In effect, it is collateral damage – a small price to pay for the bigger benefit of removing the principal defect.

sheeting The action of water dispersing off the paint surface, usually in large pools ('sheets') of water. It can indicate the ongoing effectiveness of a wax or sealant.

show wax A wax that has been created for its optical effects, rather than for durability or longevity. Usually, show waxes will contain a high volume of glaze oils to fill defects.

single-stage paint (and **two-stage paint)** Paint that has a colour layer only (rather than a colour layer followed by a clearcoat layer) is often referred to as 'single-stage paint'. Two-stage paint has a clearcoat upper layer to protect the colour coat(s) beneath.

sling The splatter from machine-polishing pads, often caused during initial pad start-up, or because of an excess of polish on the pad/panel. Starting the machine at low speeds, spreading the polish thinly, and careful placement of the pad on the panel can all help minimize sling. Also, some types of polishing pad, for example waffle or fin designs, may sling less; flat-faced pads are generally the most prone to sling.

SMART repair Localized paint restoration, with the acronym standing for 'Small/Medium Area Repair Techniques'. Typically, these are carried out by mobile operators who can spray panels or sections of panel without the need for extensive bodyshop facilities. A convenient and cost-effective option for minor paint repairs to small sections of paintwork, although the finish may not be as durable as that achieved in a bodyshop.

snow foam High-foam cleaning product made for application via foam lance at the pre-wash stage. The extreme aeration reduces effectiveness, but a longer dwell time goes some way to compensate for this.

solid finish A non-metallic paint finish is referred to as being a ‘solid’ colour – the pigment has not been mixed with metallic particles. Single-stage paint finishes are occasionally (and erroneously) termed as being ‘solid’ because they do not have an upper clearcoat layer, but this terminology should be avoided. Note that paint hardness can be dictated by the ‘solids content’ of a paint – that is, how much pigment is present.

solvent wipedown Using a panelwipe or solvent to wipe down machine-polished paint, in order to remove glaze oils, resins and waxes that may be filling defects and therefore hiding the true finish. Essential if trying to assess the true level of paint correction achieved during/after machine polishing.

spit shine The application of water to a buffed carnauba wax surface, to close the pores and increase shine. Carnauba wax is hygroscopic – it absorbs water and swells – creating a denser coating whilst the water remains present. When it evaporates, the carnauba will revert to its unsaturated state and the original finish will return.

spot contamination Contamination isolated to a small and defined area.

spot pad A smaller machine-polishing pad for occasions when the use of a larger pad would be unwieldy or unsuitable, perhaps if polishing a smaller component or narrow strip/panel (such as an A-pillar).

spur Tool with a serrated metal wheel used for cleaning (‘spurring’) machine-polishing pads; the wheel helps to remove dried polishing dust from the pad. Called a spur for the obvious reason that it resembles a spur on a cowboy boot.

strike-through Accidental breaching of a paint layer is termed ‘strike-through’. The paint finish of a car is typically made up of multiple coats of primer, paint and clearcoat. If the clearcoat layer is breached, the overall finish of the car will be irreversibly harmed and new clearcoat will have to be applied to repair the damage. Machine polishing is the usual cause of strike-through, perhaps when an overzealous polishing technique or overly aggressive pad/polish combination has been used.

substrate The surface beneath a coating, wax, contaminant or other residue. Usually a painted panel in detailing terms.

sub-surface Below the surface of the paint. Any defect that sits below the paint surface, such as etching or a scratch, is classed as ‘sub-surface’. Most contamination will sit on the surface. Water marks can be surface or sub-surface defects, due to their propensity to etch paint as well as leaving surface deposits behind (limescale).

surfactant Derives from ‘surface active agent’. The name refers to the way a product works, not what it does. This means that a surfactant can also be a detergent. A modern surfactant is typically going to do the job of an old-fashioned soap, but with more efficiency and effectiveness.

swipe test A test to assess when a wax or sealant has hazed and is therefore ready for buffing. If a finger in a clean microfibre ‘swipes clean’ when dragged across the panel, the coating is ready for levelling. If it smears, or leaves a greasy residue behind, the coating needs to cure for longer before it is buffed.

swirl mark A light scratch in the paint surface often caused by a poor wash regime. Swirls are the most common paint defect and extremely difficult to avoid (and often, to remove). Luckily, swirl marks tend to be no more than one to two microns in depth, meaning that they can usually be safely and successfully removed through paint correction.

terrycloth Fabric that has a pile made of loops, rather than strands. This means it can be more absorbent than standard cotton fabric, although modern microfibres are likely to offer higher levels of performance (microfibre fabric has a multitude of smaller filaments).

TFR (Traffic Film Remover) Strong cleaning product, usually containing surfactants, solvents and/or caustic chemicals to remove road grime and dirt. Care should be taken using TFRs on sensitive finishes.

thioglycolate An ammonium- or sodium-based ingredient used in colour-change iron removers, for tackling metallic ‘fallout’ or for cleaning wheels.

tide mark A ring of dried residue left behind by a liquid after its evaporation.

top coat The uppermost layer of paint on a car. In modern terms, this will be the clearcoat layer.

tornador An air tool that injects liquid cleaning solutions into the air jet during operation, to increase cleaning performance. Typically used for decontaminating interior hard surfaces, such as plastic trim, air vents and so on.

touch up To apply a small amount of paint to deeper defects in order to correct them. These defects cannot be corrected by the action of machine polishing, or by ‘filling’ with an oily glaze or wax: more paint is required to rectify them.

toxic customer A customer who is negative or destructive to business and is best avoided. Typically, toxic customers demand the highest levels of service in exchange for the lowest levels of payment. Be wary of customers constantly after discounts, who want to pay ‘cash’ for work, who never give enough notice when booking work in, and who never thank you for your efforts.

two-bucket method (TBM, 2BM) Wash system/process using two separate buckets, one for the wash solution and one for rinse water. Fresh wash solution is taken from the first bucket and then the mitt or sponge is rinsed in the second bucket, preventing dirt from contaminating the wash solution. Keeping the wash solution clean helps guard against swirl marks.

two-pack (2k) A more durable paint system than the old cellulose solvent-based paints – the paint comes in a ‘two-pack’ of paint and separate hardener. When mixed, the paint is activated and will become curable. When cured, the paint is durable and far more resistant to solvent attack. Paint that does not need a separate hardener is sometimes referred to as ‘lk’ paint.

unigrit Term given to a non-diminishing compound because the ‘grit’ particles do not reduce in size as the polish is worked.

veneer A thin layer of wood or metal applied to another material (or component) as the outward face. Allows for a high level of finish at relatively low cost, and can also prevent problems of structural integrity through the use of a more robust, stable or suitable substrate.

waffle weave Type of microfibre cloth weave, resembling a grid in pattern. Benefits from a large surface area and more ‘bite’ due to the irregular surface texture. The lack of pile makes it less suitable for softer surfaces, which may mar more easily.

wash bone Microfibre-covered sponge, used during the wash process. So called because they sometimes have a bone-like shape, with larger ends and a thinner middle section.

water blade Plastic/rubber ‘squeegee’-style blade, used for removing standing water from car bodywork after rinsing. If any dirt remains, it is likely to be dragged across the paint by the unyielding blade, possibly causing marring. A high-risk drying tool for most detailers, although they can be useful during wet-sanding.

waterless wash A wash product or process that is water free (or largely water free). A cleaning spray and cloths are used to decontaminate soiled panels, rather than buckets of shampoo solution, rinse water and drying towels. This method saves water, but may have a higher risk of marring paint, and may lead to more washing of dirty laundry (negating some or all of its green credentials).

wet/dry vacuum cleaner A vacuum cleaner that can clean ‘wet’ using a liquid cleaning solution, or ‘dry’ (as a traditional vacuum cleaner). These versatile devices nevertheless often need to be ‘converted’ to one mode or the other (involving a hose swap), meaning that most detailers will have a couple of vacuum cleaners at their disposal to avoid any inconvenience midway through a detail.

wet-on-wet A paint application process to aid inter-layer bonding, where a paint coating is sprayed on another paint coating when it has not fully cured. Whilst beneficial in technical terms, it creates problems for detailers trying to identify the thickness of individual paint layers, because even the best paint-thickness gauges will struggle to separate the layers.

wet-sanding An aggressive cutting of the paint surface in order to remove deep defects, carried out using sanding paper or pads, in the presence of water. The water helps carry away the cut paint residue, as well as lubricating the paper or pad. Sometimes referred to as ‘colour sanding’ due to the aggressive removal of coloured paint particles (in single-stage paint finishes, found generally on older vehicles).

whitewall tyres Type of tyre that has a white sidewall, often chosen for cosmetic reasons. Rarely seen on modern vehicles, the whiteness is attributed to the zinc oxide rubber used in the construction of early technology tyre sidewalls, and latterly, sidewall inserts in carbon black tyres; most likely to be found on classic American cars.

xylene An extremely strong solvent used as an ingredient in some aggressive cleaning products. Noted for its ability to soften, or even remove, certain types of paint.

zenith technique Machine-polishing technique where the aggression of cut is stepped up to a ‘zenith’ point in the middle of the process, and then stepped down again for the final stages. It should, in theory, maximize safety and refinement.

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